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FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

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The Four Contenders . . .

NATIONAL defence. Exports. Air commerce. Spaceflight. These Four Horsemen of the modern Apocalypse are the formidable contenders that must now be reconciled with the national interest. Upon the success of this alignment our nation may stand, fall or advance.

In recent momentous weeks decisions have been made whereby the aircraft industry is being recast in a pattern for the future—a painful experience which has yet to be undergone by the vast aerospace complex in America. It is evident—and we remark upon it with due recognition of America's continuing eminence in technology and world affairs—that while Britain is setting her industrial house in order America is still out on a spree. Her ballistic-missile programme alone engages more than a hundred thousand people. The annual cost is some £2,000 million; and it may well be asked how much longer this colossal effort can be maintained in the interests both of peace and of America's industrial stability. It will not be for ever, and it may not be for long.

The scale and nature of Britain's own defensive needs must be influenced by the probability of ultimate disarmament, by the burden and waste of maintaining our own deterrent, and by the apparently inevitable loss of most, if not all, of our bases overseas. From maintaining a status—real or supposed—as an international power we must work increasingly to sustain our very existence; which means to export the products of our advanced technologies; and which means again, in large degree, to sell our aeroplanes. Eventually, we might have added, to sell our incomparable range of civil aeroplanes, though for a time at least our Service types can still contribute to our exchequer as well as to our defence. We may add that Mr Aubrey Jones' gratuitous opinion that the Lightning and TSR.2 will never sell abroad (House of Commons, April 27) marred an otherwise laudable speech.

. . . and the Two Camps

Having polarized the aircraft industry into two powerful (and we hope not two opposing) camps by saying in effect "No financial aid to outsiders," the Minister is now about to fulfil his pledge to support new British civil projects. At the same time he has caused the operating industry to regroup; he has repealed the monopoly of the airways corporations; he has introduced new safety standards; and he has established a licensing board which will, he believes, "give constructive new impetus to British civil aviation." All this in seven months—an astonishing, and in certain of its aspects disturbing, stirring-up of the corporations *v.* independents stagnation that has existed for so long. Disturbing? To pursue the metaphor, we believe that the traffic pools into which the corporations and independents are about to plunge may be in new danger of stagnation. But upon the expansion of British air transport depends not only the interests of the nation's domestic and international commerce and communications. The general advancement of our civil aviation will mean support for an aircraft industry baffled about the future of its armaments and spaceflight obligations.

For us in Britain realization of spaceflight is almost synonymous with Blue Streak. If this project were to be discarded as a potential space vehicle as it has been as a weapon our national stature could well be diminished to one of complete ineffectuality. For, as Mr Aubrey Jones has remarked, civilizations flourish not by moral precept but by technique.

These are matters that greatly transcend industrial, and even insular, importance. This truth has yet to be fully realized; and upon our industry, conjointly with the State, the nation's future may largely depend.

FROM ALL QUARTERS

DARK INTRUDER: Taken last year in Japan this picture of a Lockheed U-2 (news story on this page) shows the tandem undercarriage and air brakes
"Aviation Week" copyright

U-2—The Moment of Truth

NEARLY four years ago, on June 1 and July 6, 1956, leading articles in this journal sought to ridicule the inept "security" surrounding the characteristics and activities of the Lockheed U-2 ultra-high-altitude research and observation aircraft, examples of which were then operating from this country. There has since been a growing realization (though it has not been widely manifest in the daily Press) that aircraft of this type were engaged in various forms of reconnaissance and/or espionage on behalf of the US Government.

The political and moral aspects of these activities are not of primary concern to this journal—on the present occasion at least; but the sombre fact must now go on record that an aircraft of the U-2 type, admitted to have been engaged in espionage, has been destroyed deep into Soviet territory, near Sverdlovsk, by a ground-to-air missile. The probability of similar flights by the RAF is now being increasingly conjectured, and in this connection it may be recalled that in July 1958 an RAF pilot was killed in a U-2 operating from a Texan base.

Significantly, in that it might have been supposed that the Russian defences would be in some degree off their guard, the flight was made on May 1. The pilot, Francis Gary Powers, a former USAF captain, claimed by Mr Kruschev to be a member of the Central Intelligence Agency, escaped by parachute, though without using his ejector seat. Not realizing that he was in Russian hands, the American authorities sought to explain the flight as an accidental intrusion during a weather survey. Powers, the Russians say (and they publish photographs in support of their claim) was carrying currency, valuables, a silenced pistol, and a poison "suicide pin." His aircraft, it is said, was equipped with reconnaissance cameras and instruments for radar detection; and during his flight—from Pakistan to Norway—the pilot was to have switched certain apparatus on and off over various points marked on a map. Declared Mr Kruschev, "There is also a tape record with our radio-beacon emissions."

The U-2 is powered with a special Pratt & Whitney J57. A single-seater, it has retractable double-wheel undercarriage assemblies mounted in tandem on the fuselage, and underwing stabilizer legs which are jettisoned after take-off. Air brakes are fitted on each side of the fuselage, aft of the extremely high-aspect-ratio wing, and the aircraft has occasionally been seen flying with wing-mounted pods or tanks.

According to *Aviation Week* the U-2 shot down over Russia was one of four operated by Lockheed under contract to NASA from Incirlik Air Base at Adana, Turkey. Finished in dark blue anti-corrosion paint, it is reported to have carried a 20in circular NASA symbol on the tail and a horizontal yellow tail-stripe 12in high with the letters "NASA" across the stripe. There were no wing or fuselage markings. The journal further reports that Lockheed began operating ten U-2s for NASA under contract in 1956. One exploded over Germany that year and another crashed in the US in 1958. (In July 1958 *Flight* reported that, in addition to the U-2 that crashed with an RAF pilot, another U-2 crashed on the following day, making a total of at least four.) Our American contemporary reports that NASA now has one U-2 at Edwards AFB, California, three at Atsugi, Japan, and three left at Adana. Aircraft of the type are said to have operated from Alaska, New York, England, Germany, Pakistan, Okinawa and the Philippines.

Britannic Discussed in the House

RAISING the matter of the Short Britannic SC.5—or 3A, as it is now more frequently known—in an adjournment debate in the Commons last week, George Wigg (Lab, Dudley) asserted that it resembled the Britannia only in name, so that claimed production advantages were non-existent; that it would be no better than the Lockheed C-130; that it would not compare with the DC-8 and Boeing 735, which would be available as soon; and that the order had been placed when there was unemployment in Northern Ireland and a General Election impending.

Replying for the Government, Geoffrey Rippon, Parliamentary Secretary to the MoA, reviewed the history of the project and said the aircraft would be ready within the stated timetable—which, broadly, was prototype flying in 1962 and Service entry in 1964.

Following the announcement of February 11, 1959 [that the Britannic 3 had been selected], certain changes were agreed. These included a 16ft increase of span by the addition of a new centre-section; substitution of the Rolls-Royce Tyne 12 for the Tyne 11; the moving of the engine centres further apart so that larger propellers could later be fitted to take advantage of improved versions of the Tyne; and increase of maximum weight to 218,000lb and fuel capacity to 81,000gal [Mr Rippon obviously means 81,000lb—Ed].

The Parliamentary Secretary wound up by saying that "the whole effort is building up according to plan, and a start has been made on tooling for production." He added that the Britannic "will be the first military transport aircraft designed to have automatic blind landing facilities.

Although not specifically mentioned in this debate (writes our Parliamentary correspondent) the fact is that, according to an announcement made earlier in the week, the production contract for the Britannic has not yet been placed; negotiations are only "well advanced." The number of aircraft "likely to be covered by the order" was stated at the same time to be ten.

APPOINTMENT of E. G. Collinson, BSc, AFRAeS, as chief mechanical engineer of the Aircraft Division of Short Bros & Harland was announced last week. He will be concentrating initially on the Britannic freighter. Mr Collinson, who was educated at Ulverston Grammar School and Manchester University, joins Short Bros from British Messier, where he was chief designer. From 1947 to 1953 he was chief technician with the same company and before that was chief technician to the Aviation Division of Dunlop Rim & Wheel Company

A "Credible" Deterrent

THAT Britain's deterrent must be a "credible" one in Russian eyes was one of the points made by Air Marshal S. C. Elworthy, Deputy Chief of the Air Staff, when he spoke at the Pathfinder Association dinner in London last Friday. Referring to today's bomber forces, he said they faced the problem that the PFF encountered in the last war: the bomber "must get through," must deliver its load. This the RAF would have to do only if our deterrent policy failed; the enemy could do so only by paying an exceedingly heavy price.

Referring to the means of delivery, Air Marshal Elworthy compared the Lancaster of World War 2 with contemporary aircraft weighing 50 per cent more, half the size and costing 40 times as much. They would be used, he said, in much smaller numbers; but they must be more accurate: "we must put our sophistication in weapons." The DCAS said that the RAF must continue with manned aircraft; flying training had to be increased, for the demand for aircrew was bigger than had been foreseen.

NOW WITH MARBORE: The SR-N1 Hovercraft showing the recent installation of the Blackburn Marboré propulsive turbojet, with which it is expected a speed of 100 m.p.h. will eventually be achieved

NOW WITH TURMO: A Saunders-Roe Skeeter Mk 12 modified to take a Blackburn Turmo 601 gas turbine in place of the D.H. Gipsy Major piston engine. The turbine installation will expedite development of the Louis Newmark autostabilizer equipment for the Wasp

IN BRIEF

Sir Thomas Sopwith is indisposed, and his RAeS lecture on May 17 has had to be postponed until the autumn.

The Association of British Aero Clubs is holding its 1960 Summer Convention at RAF Thorney Island on May 21 at 2.30 p.m., in conjunction with the Thorney Fair.

Peter G. Masefield, who recently completed his term of office as RAeS president, is to read a paper to the Royal Society of Arts (John Adam Street, Adelphi, WC2) on *Problems and Prospects of Air Transport* on Wednesday, May 25, at 2.30 p.m. Sir George Edwards, managing director of Vickers-Armstrongs (Aircraft) Ltd, will preside.

In Oslo on May 3 Dennis Hennessy, chairman of Hovercraft Development Ltd, said that fast five-ton hovercraft launches should be in regular service by next summer and 25-ton hovercraft ferries would be in use by the summer of 1962. Order books would soon be open. He estimated operating costs at 3d per passenger-mile, but said he was confident that this figure could later be halved.

Nearly 50 members of the Royal Aeronautical Society attended the branches' conference, held recently at Brough. The principal representatives were Dr E. S. Moult, the president-elect, and Dr A. M. Ballantyne, secretary of the main society. The guests were welcomed by N. E. Rowe, technical director of Blackburn Aircraft Ltd and president of the Brough branch of the RAeS.

Air Cdre A. H. Wheeler, CBE, MA(Cantab), FRAeS, has been appointed consultant to the Aviation Division of Pan Britannica Industries Ltd, a member of the Tennant Group of Companies. The P.B.I. Aviation Division is at present one of the largest operators of agricultural aircraft in the UK. Air Cdre Wheeler's present duties include the position of adviser to the ARB; and he is a trustee of the Shuttleworth Trust.

THE GREAT OXFORD FLY-IN

VERDICT of the schoolboys who collectively hitch-hiked some thousands of miles to the Shackleton Aircraft Sales Weekend at Oxford Airport last Friday, Saturday and Sunday was that it was a roaring success. Salesmen and demonstrators may give more qualified approval, depending upon the business outcome of their efforts, but the popularity of the event is now beyond question.

Twelve months have made a big difference to Shackleton's sales venture. This time last year import restrictions on foreign types were still in force. By comparison, the trickle of 1959 is fast becoming a 1960 flood; 43 aircraft have been sold in the past ten months by the Piper agents alone, and the other importers are quickly stepping up their sales drives.

Last year the Kidlington weekend (the aerodrome was officially designated Oxford Airport on May 5) was notable for the numbers of secondhand British aircraft offered for sale; this year the emphasis was much more on new foreign aircraft, particularly the executive US types. The Piper range was there complete, from the powerful Aztec down to the sporting Super Cub. Cessnas also were present in strength, with most of the range except for the 210 (which appeared the following day), and including both a 310C and the newest, sleekest 1960 310D. The Mooney Mk 20A paid a visit on Friday and over from Ireland was the latest Bellanca 260.

Hot from the Hanover show was the prototype Piaggio P.166, I-PIAK, supported by a second of these smooth miniature airliners, from McAlpine at Luton. Another from an Italian stable was the wonderfully sleek, fast little two-seater Falco; bubble-canopied Turbulent, Jodel D.117 and D.140 Mousquetaire were the Frenchmen, on sale through Rollason; from Germany came the astonishing RW3 Multoplan; and Belgium sent the Nipper, incomparably demonstrated by Bernard Neefs of Avions Fairey.

What of new British types for prospective purchasers to fly and buy? The Auster D.4, described last week and first of a new Auster range; a fluorescent-bright J5L; a Jackaroo; a Prospector; and the six-passenger civil Prentice. Later came the Garland Linnet and the "Bristol" Chipmunk, but this was the sum total. Is there a real competitor for the new foreign types among them?

Bright sunshine gave the weekend a carnival air, and the demonstration on the first day was one of the best light aircraft displays to be seen for a long time. It was understood that there was to be a straightforward fly-past by each type, but when the Piper circus got airborne they really cut loose. In every corner of the sky aircraft were being wrung out in no uncertain fashion—the Aztec getting airborne on a feathered engine; a Comanche whistling past in high-speed runs; a TriPacer leaping off the ground and into the steepest of climbs, and in any spare corner, it seemed, Piper Super Cubs in every attitude from sideways on to upside down. They weaved in and out, looped, stall-turned, slid sideways past the parked aircraft and picked a particular blade of grass for landing. Oxford is Vigors' home airport and the sales team made the best of it. Indeed, they set the pattern for the Cessnas, Austers, Piaggio, Jodels and everything else that followed. It was a spirited forty minutes and the stops were pulled out in no uncertain fashion.

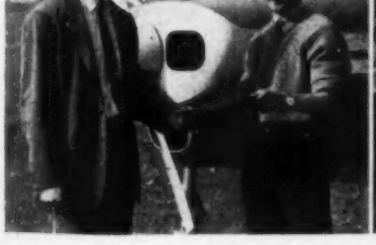
This is one of the joys of Shackleton's weekend; distributors* for new aircraft are welcome to demonstrate the newest and the best on sale in Great Britain, but for those searching for something in the secondhand market there is also plenty of variety. A few examples picked at random showed that the minimum price for a used aircraft was about £400, for a Tiger Moth with C of A due to expire in July. Among many others on offer were Cirrus Geminis at £1,750 and £1,975 (the latter with STR.9Z 44-channel VHF and MF receiver); a Leopard Moth for £1,300; and a D.H. Dragonfly with 2,570hr on its airframe but only 20 and 355 engine hours for £1,700 (it also had quite useful radio and an ADF). One of the best bargains, at a quick glance, appeared to be an almost immaculate Lycoming-powered Auster V at £1,400.

One important change since last year is that ownership of the airport has passed from the Corporation of Oxford to the Pressed Steel Company. Full aerodrome and approach control is now available (frequency is 119.7), and the firm have installed manual homing and Ekco CE.70 cathode-ray DF equipment. This new operational base for the Pressed Steel Aviation Division's business fleet (two Doves and TriPacer) bids fair to become a light aeroplane centre for central England.

**Distributors represented were: Cessna, Airwork Services, Piccadilly, London; Piper, Vigors Aviation, Oxford Airport; Piaggio, Aero Enterprises, 17 Drayton Road, Borehamwood; Jackaroo, Turbulent and Jodel, Rollasons, Croydon Airport; Bellanca 260, Peter Clifford & Co, Oxford Airport. MetaSokol, Gp Capt Mole, 3 Red Place, Green St, London W1. W. S. Shackleton act as agents for all the above types.*

SUN AND SALES at Oxford Airport during Shackleton's Aircraft Sales Weekend (see above). Right, the used aircraft park, only part of the many aircraft which flew in, and left, Tim Vigors hands over the documents of a new Piper TriPacer to E. H. B. Portman

"Flight" photographs



The balloons are inflated at the Afrikaanderplein

Mrs Wolf (USA, left) and passengers

Fred Dolder, Switzerland (right), with crew chief

SUSPENDED ANIMATION

By KENNETH OWEN

TAKING three-and-a-half hours to cover 13 miles—by air—may not be everyone's idea of efficient modern transport. But it is as good a way as any to get acquainted with the sport of ballooning, particularly when the flight includes a low-level beat-up and ends with an interesting landing technique known as "colliding with a small factory."

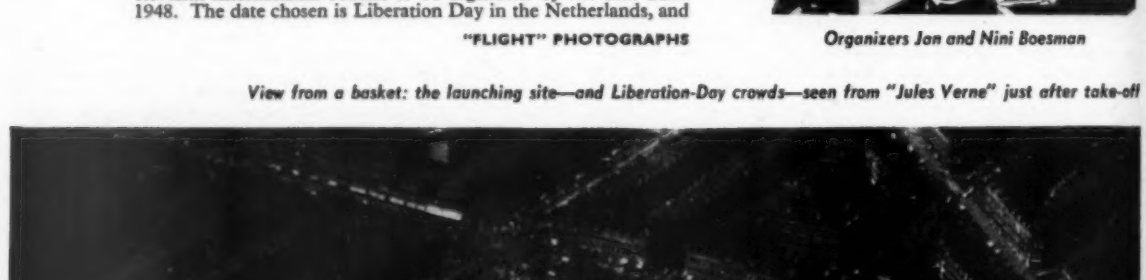
The occasion was the international balloon race held at Rotterdam on Thursday of last week, May 5, in which ten balloons from five countries took part. With virtually no wind, the contest was for landing accuracy rather than distance, the target being a 25km arc centred on the city. The winner was Mrs Constance Wolf of the USA.

Organized by the Hague Balloon Club, and in particular by Jan Boesman and his wife Nini, the Rotterdam meeting was the eleventh international contest to be organized by the club since 1948. The date chosen is Liberation Day in the Netherlands, and

"FLIGHT" PHOTOGRAPHS

Organizers Jan and Nini Boesman

View from a basket: the launching site—and Liberation-Day crowds—seen from "Jules Verne" just after take-off



Right, Dolder brings "Albis" up alongside. Below, an all-too-close close-up of well-wishers on the bridge at Dordrecht (for the major part of our flight we exceeded this altitude)

the event formed part of the city's celebrations on this occasion.

As the senior Dutch balloon commander, Jan Boesman has made 165 ascents, beginning in 1936. Together with his wife, who won international contests in 1955, '56 and '57 and has now logged a total of 155 ascents, he has given demonstrations of ballooning in many countries. *Jules Verne*, the balloon in which I was to fly in the contest, had been flown by the Boesmans in England, Indonesia, Africa, Greece, Norway, Denmark and South America.

Many of the world's best balloon pilots came together at Rotterdam this year, among whom the veteran was M Charles Dollfus. This amiable Frenchman, with a taste for balloon-decorated ties, green silk waistcoats and loud socks, made his first ascent in 1911 and has since accumulated a total of some 350 balloon flights. From Switzerland came Fred Dolder, very proud of his brand-new balloon *Albis*, which had been made for him by Albert van der Bemden, a Belgian constructor/pilot who was also taking part in the contest (the word "race," it transpired, was rather misleading).

Representing Holland were Jacques Demenint, a 47-years-old notary with 35 ascents, and Ben Steeman, a Rotterdam insurance broker and bank director—who took up the sport three years ago, he told me, as a means of relaxation and escape from the high-pressure routine of business.

The two United States entries had little in common, apart from nationality. On the one hand there was Francis Shields, individualist, enthusiast, and a millwright foreman from Philadelphia. He flew a medium-sized government-surplus balloon. In the other corner, so to speak, stood ranged the Establishment—the formidable assemblage of Mrs Constance Wolf and passengers Joan Fontaine, Charles Mills and L. P. Sharples. They flew a big balloon—German-made, expensively new—which was privately owned by Mrs Wolf.

The president of the Balloon Club of America, nonetheless, was Mr Shields.

In addition to van der Bemden, the strong Belgian contingent comprised Jeanne de Bast, wife of a Brussels restaurateur; François Schaut, an Army parachutist aged 25 who was the youngest pilot in the contest; and Lucien Segers.

I had, to put it mildly, no previous experience of ballooning. A hazy memory of aviation history, however, reassured me that balloons could provide an adequately effective means of remaining airborne. Conversation with M Dollfus and other balloonists at Rotterdam had infected me with their enthusiasm for the sport. And I was prepared to admit that, while gliding was silent, ballooning would be even more silent. Yes indeed, I agreed in advance, ballooning really was the thing.

And then, outside the hotel, I saw three parked cars, each with a wicker basket strapped to the roof-rack. It slowly dawned on me that these were not containers for laundry, sandwiches, pigeons or chickens—they were the things which would be hung beneath the balloons, and they would contain human beings.

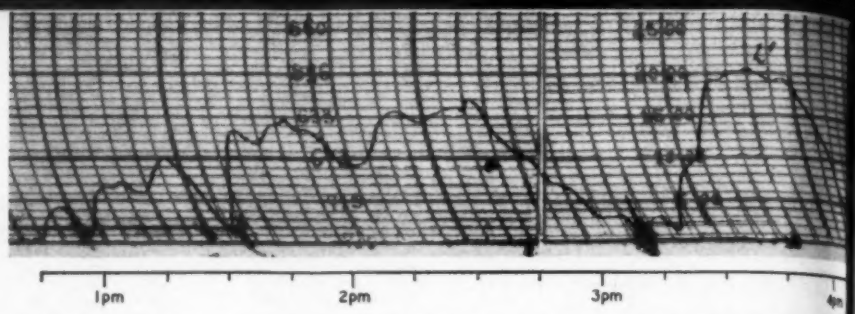
The romance of the old prints and anecdotes of ballooning history faded. The infection of modern enthusiasm for the sport

Charles Dollfus (France) and pupil Jean Lesqui

Ben Steeman (Holland) with his wife

Francis Shields (Balloon Club of America)

SUSPENDED ANIMATION . . .



The barograph record of the 3½hr flight which began at Rotterdam and ended on the southern outskirts of Dordrecht. The maximum height attained was just over 2,000m

took a heavy blow. This was the real thing—laundry baskets on car roof-tops. And one of them had my name on it.

Because balloons are complex and sensitive creatures who must not be hurried, their grooming for a 12.30 take-off on the day of the contest began some 6½ hours earlier. The site chosen was the Afrikaanderplein, a large open square on the south side of Rotterdam. On hand to fill some hundreds of sandbags and assist in preparing the ten balloons were youths from the local dockyard school, plus a sprinkling of civil air cadets.

The broad sequence of preparation was as follows. The balloon envelope (normally of rubberized cotton fabric) is first unfolded and laid out carefully on a tarpaulin square. Control lines to the gas valve and the ripping panel (a fabric segment which is torn off to provide a fast release of gas in emergency) are laid out inside the envelope; the valve (which sits across the top central hole in the balloon) is attached; and the net from which the basket is suspended is placed in position. A circle of sandbags is set in readiness around the balloon; these are later hooked on to the net as the balloon begins to be filled with gas.

A fabric connector tube is used for inflation. At Rotterdam two of the Belgian balloons used ordinary domestic gas piped from an adjoining street mains supply, and the remainder used hydrogen, supplied from cylinders. As the balloon is inflated and slowly takes shape, the sandbags are continually repositioned farther down the net in order to ensure a steady unwrinkled filling and to weigh the balloon down in case of gusts of wind.

Throughout the morning the slow process of inflation and preparation continued. The balloon which attracted most attention was undoubtedly the beautiful silver-and-blue *Albis*, which was making its maiden flight on this occasion and was accordingly to be christened with a bottle of Dutch gin by Miss Joan Fontaine shortly before the take-off. The crew

PILOTS AND BALLOONS

Pilot	Country	Balloon	Volume (m^3)
Jeanne de Bast	Belgium	OO-BAS	625
Albert van der Bemden	Belgium	OO-BGX *Oxygenium I*	400
Jacques Demenint	Holland	PH-BOX *Oxygenium II*	450
Fred Dolder	Switzerland	HB-BIV *Albis*	450
Charles Dollfus	France	OO-BGW	360
Francois Schaut	Belgium	OO-BGY	660
Lucien Segers	Belgium	OO-BGR	700
Francis Shields	USA	N4150A	550
Ben Steeman	Holland	OO-BGL *Jules Verne*	750
Constance Wolf	USA	N10W	950

which attracted the most attention was that of Mrs Wolf, and in particular the remarkable Mrs Wolf herself, clad in black throughout and featuring hairnet, net veil, shirt, very brief shorts and wide-mesh fishnet stockings.

The only non-starter on the published entry list was the baby balloon (250m³) of Charles Dollfus, which had become stuck *en route* at the Belgian border. Luckily M Dollfus was still able to participate, in a reserve balloon provided by the Hague Club.

Under a hot sun and blue sky the pre-launch activity reached a climax. Inflation was completed with a final sweet, sickly whiff of gas; basket rings and baskets were attached, ropes adjusted and ballast bags put aboard; flowers were presented to all the pilots; *Albis* was christened and the contest task was announced. At 12.35 the first balloon was away, rising steadily, with Jacques Demenint and passengers waving a lazy farewell as a deafening clamour of bells came over the loudspeakers.

Ben Steeman, his other two passengers and I climbed into the *Jules Verne* basket, which then seemed somewhat crowded, and in a confusion of sound and motion we were pulled (nicely balanced about one foot above the ground) over to the launch-point by a jostling crowd of helpers.

We were sixth to take off. At 12.45 Steeman released a final handful of sand over the side, the helpers let go of the basket and we were up and away. As we looked down on the square, we seemed to be being drawn upwards and backwards by a firm steady pull—rather like a winch launch in a glider, but in a completely windless silence. That is, it was silent up where we were, but the cheers of the thousands of spectators below—from the ground I had had no idea there were so many—and the loudspeaker commentary could be heard quite clearly.

Our initial climb took us to 300m, or almost 1,000ft, where we hung in an absolute stillness, imperceptibly drifting south-east. Behind us the cranes of the Rotterdam docks spiked up from the wide sprawl of the city, while ahead we could see the other five balloons, one quite low and the others at a greater height. Shortly after passing the Feyenoord sports stadium we began losing height, and I realized that a balloon pilot has the same active interest as the glider pilot in the effects of thermals (in which the air is rising) and areas of sink (in which the air is descending). We came down quite low over a road on the outskirts of the city before the sand thrown overboard by our pilot had its effect, and we levelled out and began to climb again. The pilot's intention would be to maintain the balloon in equilibrium by releasing ballast and gas as appropriate, and so remain at the desired height throughout the flight. This proved to be extremely difficult on this particular day, due mainly to the uneven heating effects of the strong sun on the towns, countryside and waterways over which we were passing.

Slowly and gently, we covered 15km in the first hour, touching a maximum height of 1,300m. A little farther on we found ourselves almost directly over the Aviolanda factory located at a river tee-junction on the outskirts of Dordrecht. Two of the Belgian balloons had landed behind us, while in the haze ahead we could discern two of the others. The next part of the story of our flight could well be subtitled "Becalmed over Dordrecht," for with an almost complete absence of wind we were to take over two hours to cover a straight-line distance of less than 5km.

This gave me a little time to consider some of the other aspects of the sport of ballooning. A basic point is that one has to get used to the idea that, although one is airborne, one is not necessarily going anywhere. We were simply suspended there—at 1,000m over Dordrecht, say—and we were not concerned with making a journey from A to B. Occasionally during our flight I caught myself forgetting this fact, but eventually I realized that, if I wanted to go from A to B, I should choose some other means of transport. As far as we were concerned, there was nothing wrong with travelling 3km in two hours.

The basic feeling of stillness and silence, again, was notable. From the peaceful calm of our basket we could hear the general background hum from the ground beneath—the living noise of a daytime countryside. This was caused mainly by road traffic, plus the occasional ship's hooter and a military band.

Occasionally during our flight it occurred to me that ballooning was really a crazy, impossible, impractical sport. "What the hell am I doing here, anyway?" seemed to be the question. Four grown men, standing in a wicker basket suspended from a hydrogen-filled sky hook.

An unexpected aspect of ballooning—or of this particular flight—was its variety. Our passage over Dordrecht now added low-level excitement to the high-altitude calm previously experienced. After checking the low-level wind direction by smoke from a factory chimney, Steeman opened the valve to release gas and we descended towards the city. Disappointing the crowds who ran across the Aviolanda sports field anticipating our landing, we floated across to the far bank, climbing as we encountered the warm air over the town. After drifting back over the river at about 900m we descended again and skimmed along the quayside at what seemed by my innocent eyes to be quite low (we were slightly above the height of the cathedral tower).

We then flew along the river, crossing towards the other side and losing height steadily. From an open space near the bank, Mrs Steeman and the retrieving crew called up to inquire whether we were landing and, if so, where. Behind them a procession of decorated floats was moving through the town. But the view ahead of us was of more immediate interest, for we were heading directly towards the electric cables running above a railway track.

Our three instruments comprised barograph, variometer and altimeter and, as in the case of any descent, attention was now focussed on the variometer. The readings of this instrument were being continually called out to Steeman as we descended, and he was judging the amount of sand which had to be released, bearing in mind the fact that the balloon would almost certainly rise with the warmer air on our crossing from the water to the land. To play safe he dumped an additional amount of sand just before we reached the railway; but there seemed an agonizing pause before we levelled off, skimmed across the track (with about 10ft to spare over the electric lines) and across the parallel road bridge (see photograph), and rose again in a near-approximation to a zoom climb. Who said ballooning was a static sport?

Once more we were becalmed over Dordrecht, the excess sand released having caused us to climb to no less than 2,000m. With only two bags of ballast left, and still no wind, the decision was eventually taken (after hovering for a further 30min) to descend for a landing. Gas was released from the valve, the variometer readings were called out, and we descended towards the southern outskirts of the city. Our approach was being made towards a small square-shaped harbour running off the main river; on the far side of the harbour was a small factory, and on the other side of the factory was a large area of open space.

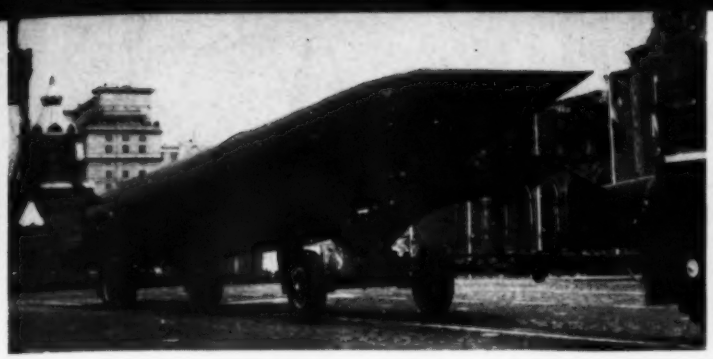
As we crossed the harbour I was looking forward to enjoying another railway-type beat-up before a landing in the open field beyond the factory. About half-way across, I think Steeman realized we would not make it; and about three-quarters the way across I think I realized the same thing.

But of course we should make it. People in balloons slow themselves down by throwing out a rope. Why should we use a factory? That just couldn't happen to us.

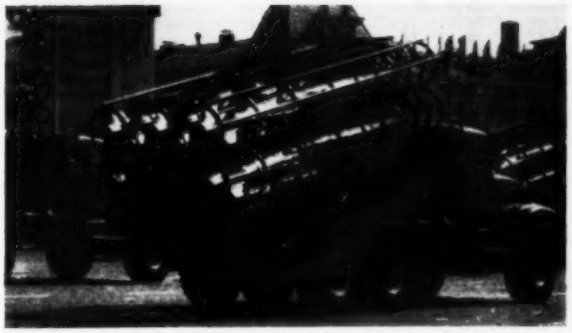
But it did. The sight of the factory buildings coming up to meet us was quite engrossing. The rate of sink over the water was so great and our supply of ballast so small that there was nothing we could do except hang on and wait for the impact. There were in fact three or four impacts against various walls and roofs of the factory before the basket fell to the ground behind what seemed to be an electric generating station. We sorted ourselves out in the basket as a number of factory workmen came running up and pulled us into a small clearing away from the buildings. We then had to release the remaining gas from the balloon, a slightly difficult task as the balloon envelope was being blown around by the wind at this time and we were having difficulty in maintaining our balance and position.

The rest was anticlimax. Just for the record, Mrs Wolf won the contest, Fred Dolder was second, and the products of the factory where we dropped in are chemicals for headache pills and tranquillizers.

Before the race, Jan Boesman had told me "Passengers are not insured but, as you may know, ballooning is as safe as drinking tea." Tea, it seems, must be a pretty exciting drink in Holland.



Three of the ballistic rockets which formed part of the procession through Red Square, Moscow, on May 1. As noted below, most of the weapons had been seen before; but these photographs are of better-than-usual quality and reveal a number of new details. The spin-stabilized weapon carried in batteries of six (right) appears to be a smaller and simpler two-stage counterpart of Blue Water



Missiles and Spaceflight

RED ROCKETS

For the first time since November 1957 the Soviet Union has displayed military rockets in public. The May Day parade through Red Square, Moscow, included a vast self-propelled 400mm gun capable of firing nuclear shells, a large number of spin-stabilized tactical rockets on tracked and wheeled launchers and a battery of anti-aircraft missiles (the same weapons as seen in 1957 but mounted on a new articulated transporter in which the missile appears to ride on its launcher rail). The missiles depicted in the two upper photographs above were described in our issue of December 6, 1958.

According to Moscow Radio, a commentator who was present said: "Through Red Square ride rocket troops, representatives of the most up-to-date service of Soviet armed forces. Soviet workers, engineers and scientists have created rockets of various ranges and purpose, from a few thousand kilometres to infinity [*sic*]. The column is spearheaded by installations which had as their prototypes the famous 'Katyushas.' The calibre of the rockets keeps increasing. Following rockets of a greater range come self-propelled installations with ground-to-air missiles capable of destroying enemy aircraft and pilotless missiles at great altitudes and with amazing accuracy. Next come rockets designed to strike targets deep in the enemy's rear, and great cigar-shaped ballistic missiles. In the rear of the column of the rocket troops come mammoth ballistic rockets. Each of these would require at least two railways trucks for transportation by rail. Possessing tremendous speed, altitude and range, they are capable of striking targets with pinpoint precision in any meteorological conditions. Glory be to the workers, engineers and scientists who have equipped our armed forces with the world's most advanced and powerful weapons!"

Complete Minuteman ICBM test vehicles are now undergoing tethered silo firings at Edwards AFB. The operational missile will have a length "just under 60ft" and a launch weight of 60,000 to 70,000lb. This compares with the 260,000lb of Atlas-D (which carries a larger payload) and the 105,000lb of Thor (which carries equal yield for one-quarter of the range). Minuteman has three solid-propellant stages, the first having four nozzles with jet reflection. Last week Strategic Air Command announced that, from June 20, six nation-wide tests of special trains will be made to determine the effectiveness of railway deployment for this missile

SKYLARK RECORD HEIGHT

It was announced by a spokesman of the Weapons Research Establishment, Woomera, on April 29, that a two-stage Skylark sounding rocket reached a record height of 136 miles in a firing from Woomera "16 days ago." The maximum height previously attained in the Skylark programme was 100 miles.

ELECTRIC ROCKET DEVELOPMENT

Engineering and preliminary development studies on an electric rocket engine are to be carried out for the National Aeronautics and Space Administration by Avco and General Electric. The propulsion unit, which would supply approximately 0.5lb of thrust for a period of months and could eventually power spacecraft on interplanetary missions, would need an auxiliary electric generating plant—probably a nuclear system such as SNAP 8.

Avco and GE were among eight companies which submitted proposals for a 30kW plasma-jet engine. The principle of the system involves passing a propellant gas such as liquid hydrogen through an electric arc, the gas being heated to some 4,000° before escaping through a rocket nozzle. The current programme will last one year and cost approximately $500,000.

NASA LIFE SCIENCES

In a recent statement the US National Aeronautics and Space Administration announced the formation of the Office of Life Sciences, with Dr Clark T. Randt as director. It forms the fifth major NASA division (the others being Space Flight, Launch Vehicles, Advanced Research, and Business Administration), and will cover the fields of biology, medicine and physiology. According to recommendations to the Director of NASA, the new office will be responsible for establishing a research centre, co-operate closely with the military services and with the rest of the scientific community, make provisions for training and education, and investigate fundamental problems relative to space environments (including the search for extra-terrestrial life).

ECHO EXPECTED

Yesterday (May 5) was the scheduled date for the US attempt to launch a 100ft inflatable sphere into orbit at an altitude of 1,000 miles as a communications experiment. Described in *Flight* of December 25, 1959, the experiment is known as Project Echo and was given advance publicity in order to assist interested scientists in planning their own observations.

Announcing the scheduled launching date, the National Aeronautics and Space Administration stated:—

"The launch is planned for a time of day so that the inflatable sphere, made of highly reflective aluminum, will remain in continuous sunlight for about two weeks. A three-stage Delta vehicle

Missiles and Spaceflight . . .

will attempt to inject the sphere into an orbit south-east from the Atlantic Missile Range, so that the orbital plane will be inclined about 48° from the equator. . . .

"No radio tracking beacon will be attached to the sphere. The third stage of the launch vehicle will carry a transmitter which will broadcast at 108.06Mc/s for eight or ten days, the expected lifetime of its batteries. Inflation of the balloon will be by residual air remaining in the folded sphere and by about 30lb of sublimating powders inside it. Water vapour will not be used."

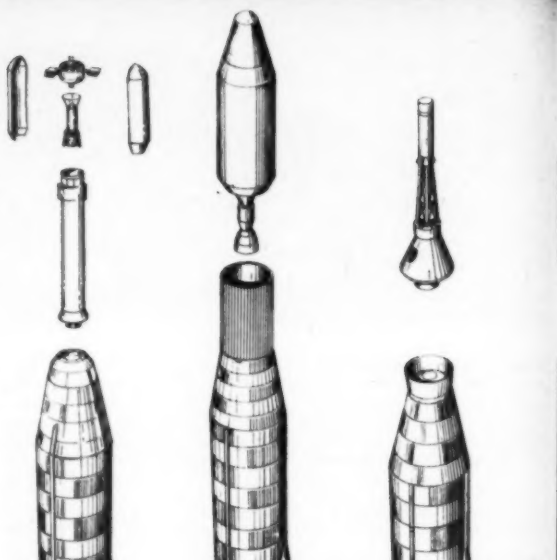
ATLAS INTO SPACE

Although most of the American vehicles placed in orbit or projected into deep space have so far been launched by relatively small boosters, the Atlas ICBM is progressively assuming its role as the premier Western space booster. Not only will it serve as the primary vehicle for American military adventures in space, but it is also scheduled to accomplish almost twice as many scientific shots as any other booster during the next decade, over 100 launchings being programmed. Histories of the development of the ICBM have been contained in our annual Missiles issues, the most recent of which was on November 6 last. All Atlas, both military and scientific, are produced in an *ad hoc* plant north of San Diego, operated by Convair (Astronautics).

Most of the missile body consists of a monocoque tank for liquid oxygen and RP-1, fabricated by precision-welding from thin stainless-steel sheet. So thin is this sheet that the complete tank is permanently pressurized throughout the life of the missile in order to maintain its shape. Guidance equipment, electric batteries and most of the airborne systems are faired in packages along the sides of this tank. Propulsion is provided by five gimbal-mounted Rocketdyne engines. Main thrust is imparted by a central sustainer flanked by twin boosters, and a unique feature of this arrangement is that all three engines are ignited on the ground. With the present MA-2 powerplant launch thrust is approximately 360,000lb, and this will rise by 20,000lb when the MA-3 engine is introduced. The boost engines burn for about one minute and are then jettisoned. The Atlas is then well above the atmosphere so that the thrust of the sustainer has risen to approximately 80,000lb, and it continues to burn for a total period of some 270sec. To the sides of the tank are hinged twin vernier engines, each with a thrust of approximately 1,000lb, which enable fine corrections to be made to the final trajectory.

The design of the Atlas was frozen in 1955. Fabrication began in the same year, static firings were conducted in June 1956, complete missiles were delivered to Sycamore Canyon and Cape Canaveral in the autumn of that year and the first twin-engined Atlas A rose from the pad in June 1957. Operational capability of the ICBM was achieved at Vandenberg AFB last September, and the Atlas has since logged one series of 21 consecutive successful launchings. As an ICBM it can deliver a thermonuclear warhead over a range greater than 7,000 n.m. (8,061 miles). As a space vehicle it was first proposed (in a classified document issued by Convair in May 1953) that it should place a television-equipped reconnaissance satellite in polar orbit. The following year Krafft A. Ehricke joined the company and has since been responsible for the direction of the Atlas space programme at Convair Astronautics. In 1957, following the advent of Sputnik 1, Convair proposed a comprehensive space programme, major parts of which

Aeronutronic, a division of Ford Motor Co, has been chosen by NASA to negotiate for the manufacture of a 300lb instrumented package for impact on the Moon within 24 months. This impression of the final separation at a Lunar height of 20 miles shows the retro-rocket firing to bring down impact velocity



Above are depicted in "exploded" form four of the chief spacecraft based on Atlas. On the left is Atlas-Able, 99ft 4in tall, with a 32ft 2in upper stage. Next comes Atlas-Agena, 88ft 2in in height with a 21ft 8in upper stage. The third vehicle is the Mercury manned-capsule configuration, 94ft 6in in height with an overall payload length of 25ft. The final vehicle is the advanced Centaur, 107ft 8in high and with a 25ft second stage of 10ft diameter. For comparison, the Atlas-D model ICBM has a length of 75ft 10in with Mk 2 nosecone and 82ft 6in with the Mk 3 or Mk 4 cones

are currently active projects. In January of this year the National Aeronautics and Space Administration outlined a ten-year programme before Congress which charts virtually the entire Western field of endeavour during the first decade of space exploration. Of 260 major launchings described in the programme, Atlas is scheduled to be employed in 104. This total does not include USAF launchings based on Atlas, such as Midas and Samos.

Talking Satellite Although of little real scientific consequence a number of notable "firsts" were achieved by Atlas 10-B, originally a standard ICBM, which was fired from Cape Canaveral on December 18, 1958. In a programme sponsored by the Advanced Research Projects Agency, 10-B had its guidance programmed to put it into orbit—and, since the entire body of the Atlas was involved, it was far larger than any other satellite launched up to that time. The payload was an Army Signal Corps package consisting largely of duplicated communications relay equipment designed to tape-record voice or code messages and re-broadcast them upon command from the ground.

Data for this firing included the following: launch weight, approximately 245,000lb (roughly 15,000lb less than that for a typical D-series ICBM); velocity relative to Earth's surface after sustainer shut-down, 25,394ft/sec or 17,314 m.p.h.; gross weight in orbit, "not more than 8,661lb" (it is impossible to determine the precise weight of residual propellants); payload, 1,221lb (the largest of any American satellite during the IGY); initial perigee, 110.6 miles; apogee, 911 miles; period, 101min; inclination, 32.3°; the batteries lasted throughout December but Atlas 10-B is believed to have re-entered on January 21, 1959.

Atlas-Able The Able vehicle is a highly developed one, a number having been fired by Thor boosters from April 1958. It was originally evolved from the second-stage of the Vanguard satellite launcher and consists of a main cylindrical portion powered by an Aerojet-General WFNA/UDMH engine and a third stage by Allegany Ballistics Labora-

tory with a solid motor and spin stabilization. At the tip of this third stage is carried the payload, in a Space Technology Laboratories vehicle having vernier control and an injection rocket. Slightly different configurations were used in some of the earlier Thor-Able shots, which were used for carrying mice or for testing ablative nosecones.

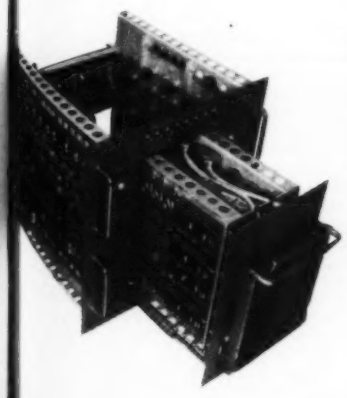
When mated with Atlas, the increased payload/range capability enables quite large vehicles (over 200lb payload) to be launched into deep space. All these shots are directed for NASA by the USAF Ballistic Missile Division. Space Technology Laboratories manage the programme and act as associate contractor to the AFBMD, while Convair are responsible for the booster and adapter and conduct the launchings. The first Atlas-Able was a lunar probe launched on November 26 last. To save weight Convair removed some telemetering and other test equipment; standard electronic circuits were re-arranged and the autopilot and flight programmer were adapted to the deep-space mission. This vehicle was the first deep-space launching from Complex 14 at Cape Canaveral, one of a pair of Atlas pads modified to receive the lofty multi-stage spacecraft. After launching, the Atlas functioned perfectly but an upper stage failed. At least two additional firings are planned, for August 25 and November 14.

Atlas-Agena At present the Agena second stage, developed by Lockheed Aircraft and powered by the fully controllable Bell Aircraft Hustler engine, is the most capable available in America. Evolved from the original Hustler vehicles used in the Air Force Discoverer programme, Agena-B is an improved vehicle which was described on this page last week. One of its major advantages will be that the Hustler engine can be restarted in space. When matched with the Atlas, Agena-B is scheduled to place 5,000lb in a 300-mile orbit, hard-land 800lb on the Moon, soft-land 200lb on the Moon or deliver 1,000lb to the vicinity of the inner planets. Launch weight of the complete vehicle will be approximately 280,000lb.

Project Mercury Initiated by NASA in October 1958, this is the programme to put a man into space; the most recent major description in these pages appeared on February 12. Although the first astronaut to fly will do so in a Redstone, all orbital flying will be accomplished on series D Atlas. Mounted atop the ICBM will be the McDonnell capsule, roughly conical in shape and about 10ft high, excluding the jettisonable boom carrying the escape rockets. Initial capsule flying was done with the Little Joe booster, and on last September 9 the first Big Joe was fired in which an unmanned test capsule rode on an Atlas. No schedule has yet been announced for the manned launchings, but these missions will start down the Atlantic Missile Range at an altitude of 120 miles. After some 24hr, retro-rockets will be fired to bring the capsule back into the atmosphere.

Midas and Samos These names identify satellites initiated by ARPA and now transferred to the USAF under the direction of the AFBMD. Midas is part of an anti-ICBM system involving the use of 12 to 15 satellites carrying infra-red sensing equipment to detect enemy missile firings. The first Midas was launched from Complex 14 on February 25, but was rendered abortive by faulty stage-separation. Samos (originally Sentry) is a reconnaissance satellite carrying various types of data-acquisition equipment. Both types of satellite will be fired later this year from a new complex at Point Arguello, south of Vandenberg AFB.

Centaur The first US spacecraft in the high-energy class, Centaur will be capable of putting a 9,000lb payload into orbit, of soft-landing 730lb on the Moon, or of sending large instrumented probes deep into space. Centaur will also serve as a payload stage (S-V) of Saturn. Contracts were originally awarded to Convair and (for propulsion) Pratt & Whitney Aircraft by the USAF Air Research and Development Command, acting for ARPA; the programme was transferred to NASA last July. The basic Atlas tank maintains its full 10ft diameter to mate with the Centaur second stage. The latter is made by Convair to similar pressurized monocoque principles, and contains liquid oxygen and liquid hydrogen for twin Pratt & Whitney LR115 engines of 15,000 to 20,000lb each. First flights are scheduled for next year, from Convair's new space-launching Complex 36 currently being completed at Cape Canaveral.



On the left is Cavalcade, the analogue/digital converter developed by Bristol Aircraft and described here. Below left, is the Fresco airborne frequency meter with digital output which enables the fullest use to be made of telemetry set capacity. Below right is a complete Timtape installation in which magnetic-tape recordings of telemetered flight data are converted into punched cards for analysis by a Deuce or IBM computer

BRISTOL INSTRUMENTATION

Last week the guided-weapons department of Bristol Aircraft released basic information on three of their major pieces of equipment developed for collecting and handling flight data from missile firings. These units are known as Timtape, Cavalcade and Fresco.

Timtape (Time-Multiplexed Telemetry Automatic Processing Equipment) converts magnetic recordings of the standard RAE 24-channel time-multiplexed telemetry system into punched cards. An analogue record is also provided. Other weapon contractors are supplying tapes for reduction by this system, which requires no special provisions to be made in the sender. The telemetry system is capable of recording 126,000 samples in each minute of flight.

The common practice of embodying flight standards in the transmitted information has been utilized to provide automatic correction for variations in telemetry-system characteristics. Transducer calibrations can also be injected into the data correcting system. The high-speed analogue/digital converter in which these correcting facilities are incorporated has an accuracy of better than 0.5 per cent of the maximum excursion measurable over the telemetry system, but the overall accuracy of the reduced data varies with the quality of the primary record. Accuracies better than four per cent should be maintained from in-flight measurement to punched card. The machine is self-checking and has been proved reliable in several months' routine operation.

Cavalcade (Calibrating, Amplitude Variation and Level-Correcting Analogue/Digital Equipment), an analogue to digital converter with some unusual features, has been developed as part of a new data-processing facility. It is particularly useful where the analogue voltage to be digitized is related to parameter value by comparison with reference or standard levels. An adjustable scaling facility is incorporated which allows input data to be corrected according to a predetermined calibration curve.

Thus, suppose a pressure measurement is made in a complex instrumentation system using a calibrated transducer. Measurement accuracy can be made independent of changes in the linearity of the instrumentation system (which may contain modulators or demodulators) if calibration and subsequent measurements are made by reference to standard levels, which by a time-sampling process also pass through the same instrumentation system. In such an arrangement an analogue voltage derived from the transducer can be applied to the new analogue/digital converter, together with up to five standard levels, and the initial calibration set up on a patch board. The digital output will then represent true pressure without further editing or interpolation.

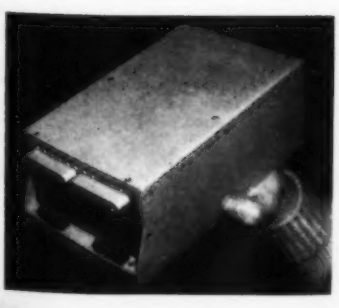
Cavalcade currently provides an eight-line binary digit output, and the inaccuracy introduced is less than 0.5 per cent. Conversion time is less than 0.003sec, and parameter values can be digitized 100 times per second. Developed originally for processing data derived from the 24-channel RAE system, the device is expected to find application in a variety of instrumentation systems.

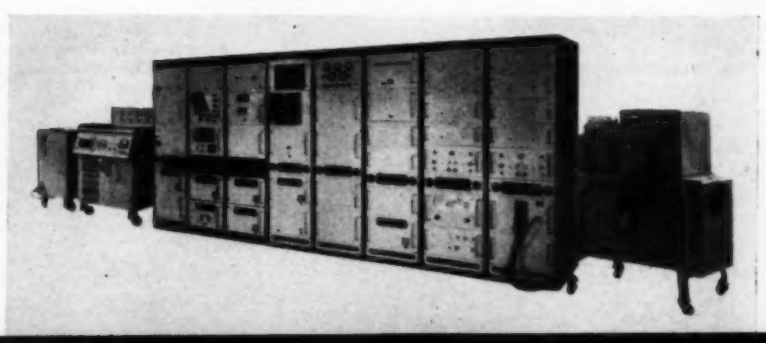
Fresco (Frequency Sampler Coded Output) is a development in flight instrumentation enabling accurate information on slowly varying parameters (for example, pressures varying up to 2c/s) to be transmitted over standard RAE 24-channel equipment. Accurate telemetry of audio frequency is often extremely wasteful of channel space or bandwidth. It frequently happens that the frequency is a precise measure of a slowly varying parameter, and whilst this demands only a few cycles bandwidth the signal from the measuring device requires a bandwidth of several kilocycles. Such instances occur with some forms of flowmeters, and are particularly associated with vibrating cylinder-pressure transducers. Transducer output is an audio-frequency voltage between 3.5 and 10.5kc/s depending on the pressure.

Fresco enables up to ten such outputs to be telemetered using only a quarter of the telemetry set's capacity. Each transducer is separately identified and transmission of standard levels before each measurement ensures accurate interpretation of the radix-eight binary digital information signal. At normal 100c/s switch motor speeds each transducer is sampled four times per second, but this rate can be increased if less than ten transducers are connected in.

Fresco is fully transistorized and very compact; $3\frac{1}{2} \times 5\frac{1}{2} \times 10$in, and weighing $6\frac{1}{2}$lb, it embodies a complete frequency counter and digital coder, the output of which can be wired direct to six channels of a conventional 24-channel switch motor. There are no moving parts, and the unit has been tested from 0 to 55°C at a vibration level of 10g from 200c/s to 5kc/s.

Cavalcade and Fresco will be shown on the Bristol Stand (B58) at the Instruments, Electronics and Automation Exhibition at Olympia, May 20/28.





FLIGHT SYSTEM SURVEY

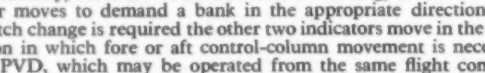
Smiths Para-Visual Director

The new system as installed in a Dove

IN a paper first read at the 13th IATA technical conference at Lucerne, Smiths Aviation Division have revealed a revolutionary development in flight-director instrumentation. Known as the Para-Visual Director, it is primarily the work of A. M. A. Majendie, the Division's director of operational requirements, and K. Fearnside, director of research and engineering, and is being demonstrated to IATA delegates in a de Havilland Dove.

PVD consists of a series of helically striped ("barber's pole") rods which are viewed through long slits in their housings. When the rods rotate in accordance with commands from a flight-director computer they provide a moving pattern of white diamonds which gives the pilot an instruction which he can perceive and follow without directly watching the indicator. Three PVD indicators are arranged above the instrument panel just below the pilot's line of sight, one athwartships and the others almost longitudinally on each side. When the flight-path is correct the indicators are stationary, but if the aircraft deviates in heading, the central director moves to demand a bank in the appropriate direction. If a pitch change is required the other two indicators move in the direction in which fore or aft control-column movement is necessary.

PVD, which may be operated from the same flight computer as the autopilot, has proved effective both for manually controlled blind landings and as a direct monitor for automatics. While following PVD a pilot may directly scan a wide area—for instance, he may watch other instruments or look ahead for contact with the ground.



Typical display unit of the Para-Visual system

PVD, probably the most advanced innovation in director instrumentation, is to be fitted in the Airco D.H. 121. It has also been tried in helicopters and may find many other applications. It originated from an attempt to overcome shortcomings in the conventional dial arrangement when this had to be used in actual poor-weather operation.

Traditional instruments have consistently failed to solve three particular operational problems: first, the difficulty of transition from instrument to visual flight after a poor-weather approach; secondly, distraction from instrument control caused by factors such as fatigue or keeping a look-out for other aircraft; and, thirdly, the monotony and inefficiency of using instruments to monitor automatic controls. This particular problem reaches its peak during high-altitude, high-speed cruising in a jet transport, and in the final stages of an automatic approach, automatic flare, or automatic landing, on any type of aircraft.

These three problems all stem from the same basic difficulty. Using traditional instrument designs a pilot sees only what he chooses to look at. The exception to this in the contemporary cockpit is the flashing warning light, but such devices have to be reserved for genuine emergencies because, under critical conditions, they can seriously distract the pilot's attention from other urgent tasks.

The problem is to provide flight-control intelligence without diverting attention from other tasks and without preventing the pilot from looking freely about, either through the windscreen or within the cockpit, so that he can take appropriate corrective action from the information provided without serious interruption of his other tasks. The solution produced by Smiths is the Para-Visual Director.

Systems designed to feed information to the pilot when his attention is directed at some independent task can be broadly classified into those that depend on visual information and those that do not. Any of the latter kind must be capable of providing angular attitude intelligence about pitch and roll axes, and must also be able to signal a malfunction condition. Fascinating possibilities arise for the non-visual requirement; theoretically it would be possible to employ the senses of taste or smell; but, unfortunately, the inadequacy of these senses in the interpretation of angular errors rules them out at the start. Tactile—i.e., touch—information demands more serious consideration, but there are formidable objections—effects of turbulence, the need for permanent and uniform physical contact with the source of signal intelligence, the difficulty of indicating malfunction, attenuation through clothing and the difficulty of relating tactile with visual information. Such devices as stick-shakers are not useful for primary flight control.

Smiths have had considerable experience in the development of audio-airspeed indication but, unfortunately, there are serious obstacles to their application to overall flight control. First, it is extremely difficult to provide effective intelligence about the two axes required; secondly, audio intelligence over prolonged periods is extremely tiring; thirdly, passive indication of malfunction under power-failure conditions is only possible if continuous noise is present in normal use. Finally, the aural senses are already fully occupied with radio and intercom.

For visual systems there are only two ways of providing the pilot with intelligence when he is concentrating on any point at random within his field of view. Either the intelligence is superimposed by optical means upon his field of fixated vision, or adequate intelligence is provided external to the direct line of sight but still within his general field of view.

For the first method any optical projection system must interpose a reflecting transparency in the pilot's line of sight, but serious disadvantages are that it is of little use during manœuvring or turbulent flight; that it is unusable when the pilot's line of sight is more than about 8° from the centre-line of the projective display, e.g., during lateral displacement or wind drift; that it is unusable when the pilot's attention is within the cockpit; and that indications of malfunction are not inherently available, except to an attentive pilot. In addition, although ground and projection display are within the line of sight of the pilot there is no guarantee that he will perceive both. Smiths have carried out regular automatic landing trials with such a system even during fog conditions, and have confirmed the opinions here stated.

The last remaining solution is to provide adequate visual intelligence external to the pilot's field of fixated vision, but still within his general field of view; and the Smiths PVD does this. Tests suggested by Capt Majendie, and carried out by E. S. Calvert of RAE Farnborough just over ten years ago, showed that significant visual clues were received by a pilot when landing from the dynamic pattern of the runway environment. It was also shown

(*Continued on page 655*)

PORTER and PROSPECTOR in the Air

Nos 121 and 122 of the Series*

The two aircraft tested (Porter to the right) were at the recent Hanover Air Show

I HAVE a feeling that the Swiss-built Pilatus Porter will be rated one of the most successful designs of the decade. There are already a number of testimonials from a wide variety of agencies which confirm this opinion and my own experience of the aircraft leaves me in no doubt at all. I saw the prototype at the Paris Show last year, looking very ugly and chunky. I saw it again at Thruxton in December and flew with it while some air-to-air photographs were taken. Most recently I saw it performing in direct comparison with Dornier Do 27 and Prospector at Hanover and finally had the chance to fly it myself. As I mentioned in my initial report on Hanover, the Porter beat all the other types in STOL performance in identical wind and ground conditions—and the other types are no chickens.

In *Flight* for January 1 we described the special features of the Porter, noting its large cabin, versatile loading arrangements, excellent construction and general layout. Let me add here that official trials employing ordinary pilots have shown that the aircraft significantly improved on its brochure performance; and it can operate from Swiss glaciers at heights and in conditions which stop the Piper Super Cubs. Its permissible c.g. travel is from 10 to 36 per cent of s.m.c.—a remarkable spread—and tailplane incidence is adjustable so that full load at aft c.g. may be trimmed

By MARK LAMBERT **"FLIGHT" PHOTOGRAPHS**

out in a glide with full flaps extended. One feature which contributes greatly to its STOL capability is the large wing of 306.8 sq ft area, which allows a 12.9lb/sq ft wing loading. Power loading, with the Lycoming supercharged GSO-480-B1A6 engine of 340 h.p., is 11.7lb/h.p. Maximum take-off weight is 3,970lb, at which the Porter has achieved an average take-off run in still air at sea level of 120m.

Incidentally, five Porters are now flying and a first production batch is under way. The first machine was bought by Hermann Geiger, the Swiss alpine pilot, who has described it as the best alpine aircraft yet produced. The second was at Hanover for demonstrations. The third is now in Nepal, where it has landed four people on the north-east saddle of Daulaghiri at almost 19,000ft. The fourth and fifth are bespoke respectively for a customer in Montreux and the Zurich aero club.

Cockpit layout is distinctive, the pilot's seat being well forward under the blown windscreen and the leading-edge of the wing at about eye level. The whole floor is flat and linoleum-covered and there is a wide shelf across the width of the cabin level with the bottom of the instrument panel. It covers a cross-bracing strut for the mainwheel oleos, but it also serves other purposes, and I was able to use it as a desk for writing notes.

With a suction pump and 24V electrical system, full instrumentation and radio may be fitted: dual control is also possible, but Pilatus point out that this is hardly likely to be required.

Throttle and pitch levers are on the left wall of the cockpit, and tailplane trimming and flap winding handles are concentrically mounted in the centre of the roof. Position of the double-slotted flaps is indicated by a red-and-white-striped rod which emerges from the left leading-edge of the wing. Both handles have robust and simple chain-drive actuation. Toe-pedals operate the hydraulic wheel brakes independently and the tailwheel may be set locked central, free or connected for steering. In operation, only the steerable setting need be used, the wheel unlocking of its own accord to allow castoring for tight turns. Steering is re-engaged simply by feeling for the spring lock with the rudder bar. Both wings can be clearly seen by the pilot and the engine obstructs forward view relatively little. Engine-starting is electric, using an impulse magneto setting on one of the magnetos.

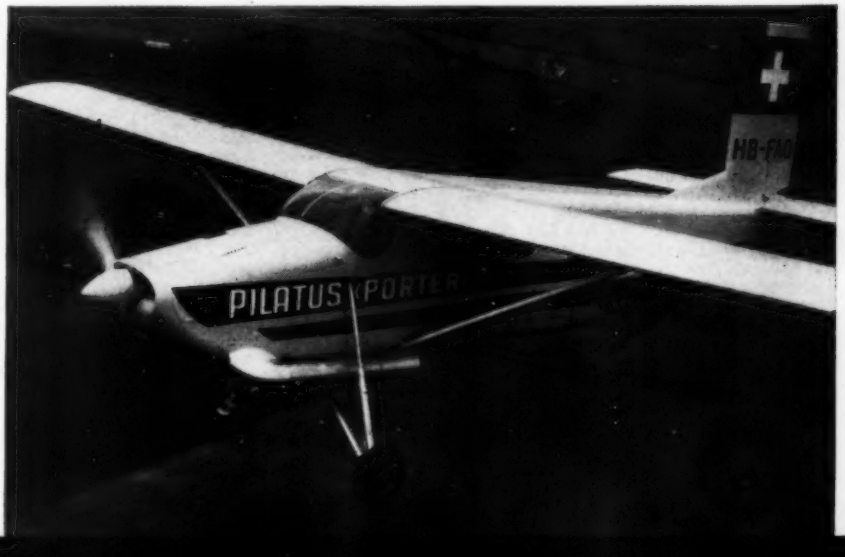
When I flew, Herr Böhme, Pilatus test pilot, sat beside me and gave instructions about engine settings and other procedures. Taxying was very easy, though the throttle had to be treated respectfully in order to avoid overloading the supercharged engine. We had one passenger in the back and the c.g. was at about 14 per cent—near the forward limit. For take-off I set trim neutral, flaps at 30deg, pitch fully fine and applied full power against the brakes. On releasing brake we rolled forward, pushing to lift the tail and pulled off as soon as the a.s.i. passed 70km/hr. We wound in flaps almost immediately and settled into the best rate of climb, clean, at 130km/hr. There was no noticeable swing on the take-off run.

During the climb I got an impression of light responsiveness which is exceptional for this kind of aircraft. The noise level was fairly high, though not as high as it would have been without that great augmenter exhaust pipe. I had previously noticed that the Porter sounded surprisingly quiet from outside.

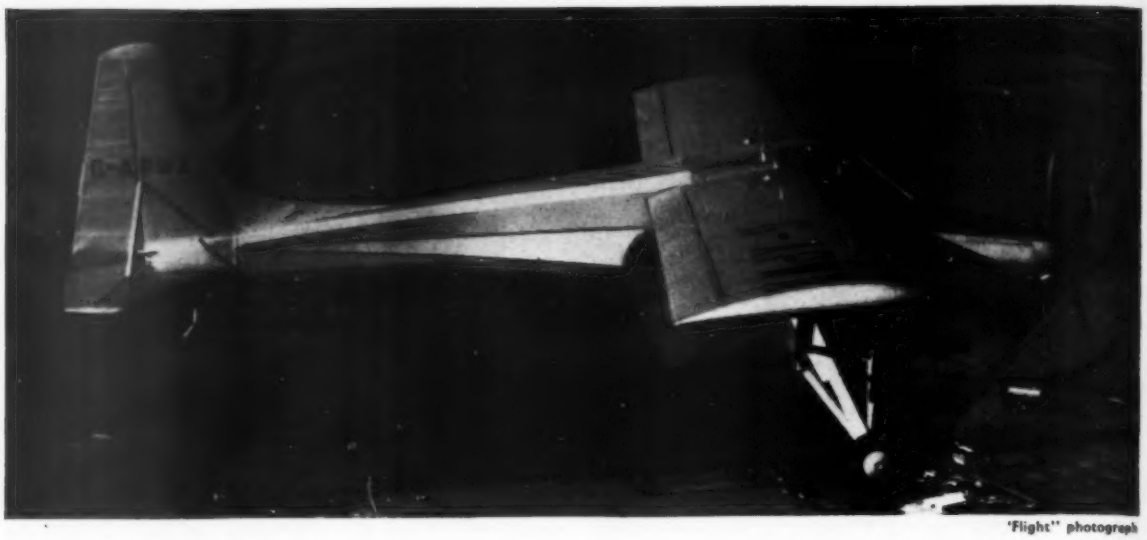
At 700m I levelled off, set 70 per cent power with 1.1atm boost and 2,600 r.p.m. and the speed settled at an indicated 170km/hr, giving an r.a.s. of about 114 m.p.h. On trying some turns I noticed exceptionally good harmonization between rudder and ailerons with a very good rate of roll and light stick forces. Laterally the Porter was neutrally stable and longitudinally it produced a few slow oscillations after being disturbed from trimmed speed. I could make reasonably true turns with either rudder or aileron alone, and reversals from one steep turn to the other required only a little rudder. The aircraft would fly hands-off quite happily—indeed, I realized as the flight progressed that the Porter is a hands-off aeroplane and can be comfortably trimmed in any flight condition. For a specialized type with a large slab wing and bluff fuselage these handling characteristics were surprisingly good.

[*Continued overleaf*

**The last numbered article in this series was that on the Auster D.4 (No 118, in "Flight" for last week); but brief handling articles on the Nord 1110 and Sikorsky S-62 at the Hanover show, also published last week, brought the number of aircraft tested by staff members to 120. These reports on the Porter and Prospector increase the total to 122.*



"... the pilot's seat being well forward under the blown windscreen and the leading-edge of the wing at about eye level"



"Flight" photograph

PORTER and PROSPECTOR in the Air . . .

The short little control column, designed to move about beneath the shelf, was perfectly comfortable to use and the light and effective ailerons made tight manœuvres particularly pleasant and easy. Yet they did not seem to affect the natural stability of the aircraft for long straight-and-level flights.

I next closed the throttle and, without resetting the tailplane, held the Porter level as the speed fell off. Progressive backward stick, with a mounting pull force, accompanied the slowing down until at about 90km/hr I could no longer maintain height yet was nowhere near the stall. All the while the ailerons remained light and very effective. We were flying at a forward c.g., so that the elevator lost effectiveness fairly early, but stalling would probably be impossible at almost any c.g. unless the tailplane incidence were changed—a safety feature for careless manœuvring.

Any aircraft with a movable tailplane should always be flown trimmed if elevator effectiveness is to be fully maintained. The Porter's tailplane can be set to −7° and this I now did in order to try the stall itself. As I again reduced speed, the warning hooter sounded plaintively and a short judder announced entry into the stall at about 70km/hr i.a.s. Neither nose nor wing dropped and we simply drifted down in a level attitude. Aileron control remained light and effective and the whole performance could not have been more innocuous. After regaining flying speed, I wound out 10° of flap, which produced a barely noticeable trim-change. Full flap called for a little trimming but the Porter would then fly hands-off at 95km/hr quite happily. It simply had to be adjusted and settled into its new groove. At such low speeds the rudder was slightly sloppy yet adequately effective, and a good deal of it was needed to compensate for large aileron deflection. The ailerons remained particularly good, with quick, exact response and light stick forces. With the tailplane still fully negative I stalled at 75km/hr, again with a slight judder, but this time also with a bit of a lurch. Again, neither nose nor wing dropped. Rapid application of full power could be easily held with forward pressure, but was better trimmed out, as might be expected.

We returned to Hanover airfield and, joining in the mêlée for landing, chose the eastern taxiway lying more or less into a light wind. I made the approach with full flap, tailplane at −7° and a trickle of power. The angle of descent was very steep with full visibility past the flat-topped engine cowling. The Porter settled quite happily into the groove and required very little correction. When ready for the round-out I cut the power and pulled the stick back. The rotation into the three-point attitude was relatively small, because the Porter sits fairly flat on its three wheels, and we arrived for a well-cushioned touchdown with a little drift on. All controls remained light and effective and brakes could be immediately applied until the tail lifted off the runway. We stopped in about 50yd without any difficulty.

It is extremely rare to find an aircraft which looks so useful and has such good performance and which also flies well. Pilatus have really made an excellent job of the controls, so that the Porter is stable as a hands-off aeroplane in all configurations and yet is light and crisp to manœuvre as well. Almost any pilot could fly it comfortably and safely and would find no difficulty in achieving its extremes of performance. I have rarely been so impressed by any aircraft.

Prospector—". . . one of the very few high-wing aircraft in which the pilot can see back over the top wing without any contortions. . . . Forward visibility is quite exceptional"

The Prospector

DURING the Hanover Air Show I had one of those opportunities which all too rarely comes my way—I was able to take over an aircraft and fly it for about ten hours, instead of the single flight which must usually suffice for a handling report. It was a Prospector, completed by Lancashire Aircraft at Samlesbury on the evening before the show was to open. I jumped in at about 5 o'clock in the afternoon and, being extremely pressed for time, made straight for Stansted and Customs clearance, hoping after that to reach Calais for the night. As it happened I began to run short of daylight over Kent and returned to Southend. Next morning I flew to Hanover in 4hr 45min, stopping at Antwerp for fuel. I should explain that this Prospector was fitted with a full-span spray boom and a large wind-driven pump beneath the fuselage so that its 70 per cent cruising speed was only 93 m.p.h. instead of the 125 m.p.h. of the clean aircraft. I also took-off from Samlesbury with the hopper part-filled with water and a load of exhibition material and spares in the back. The water I sprayed away over Lancashire as I pressed on southwards. It was a bit of a rush job.

I forged along steadily, grateful for some useful tailwinds, and finally had time to stall and try some steep turns a few minutes before landing at Hanover, over seven flying hours after leaving Samlesbury. During the show, to help out the manufacturers, I made several demonstration spraying runs, dispensing clouds of red-dyed water and making turns at the end of each run as steep as I thought prudent. I had practised this technique over some heathland away from public eyes. After three days of this pseudo-agricultural flying I made two flights with the other Prospector at Hanover, which had no spray booms.

I first flew the EP.9 prototype at Stapleford Tawney in 1956 (*Flight* for October 26, 1956) and had gained a very good impression of the machine in a single flight in very poor weather. I find that my opinions have changed relatively little since that flight, except that very considerably increased experience makes me feel more positive about some criticisms.

But first I must record some very good points about the Prospector. At normal weights and configurations it is a simple and docile aircraft to fly, if unexciting. Its singular layout also makes it extremely useful and offers the advantage, unique in this size of aircraft, of the straight-in rear loading door which also serves well for parachuting (*Flight* for March 4). The structure is sound and tough and the speed range is exceptionally good, varying from about 40 m.p.h. to a top cruising speed of over 125 m.p.h. The 295 h.p. Lycoming engine with three-blade Hartzell propeller provides greater power than before and considerably improves take-off and climb. It is reported that the three-bladed Piaggio propeller offers even greater improvement. The brand-new engine in my Prospector behaved impeccably.

Visibility is exceptionally good and this is one of the very few high-wing aircraft in which the pilot can see back over the top of the wing on both sides without any contortions—a feature I

found particularly useful on the crowded apron at Hanover. Forward visibility is quite exceptional, because the engine cowling slopes away from knee level and the windscreen is wrapped round at the sides to well below knee level. All controls are well placed for right-handed operation and can be reached easily, although parking brake and primer are out of reach if the shoulder harness is secured. The undercarriage has a track of over ten feet, large tyres, light and effective toe-operated brakes and a rubber-in-compression suspension system which fulfils its purpose extremely well.

Access to the rear cabin is either by opening or completely removing the rear hatch or by a car-type door to port. There is a car-type door either side of the cockpit. Both slam firmly shut, contain a sliding window and will remain open even with the engine running. A sensible, stout clip and simple release mechanism are provided to this end. In my aircraft most of the rear cabin was taken up by the 170gal hopper, but there was still room for two small crates, a display picture several feet square, a 5gal can of oil, a drum of chemicals, a spare tyre, box of spare parts and my personal luggage—not a very heavy load, but certainly an awkward one. With the hopper empty the c.g. was about 2in aft of datum, the maximum travel being a little over 8in. I flew the Prospector a good deal with the hopper half full of water and noticed no deterioration in handling, but only the expected reduction in rate of climb and acceleration. I did not fly with the hopper full.

My first take-off was surprising, because I set the powerful elevator trim at neutral, not remembering that it ought to be well over halfway towards fully nose-heavy. The Prospector loses no time about getting airborne and the nose sits very low on the horizon, even during a steep climb. When we leapt off the ground I watched the a.s.i. carefully and found I had to apply a two-handed forward push to stop speed falling below 40 m.p.h. This was entirely my own fault. In normal conditions, the trim lever need hardly be moved at all from its initial forward setting. Trim changes with speed and power are very small and 10° of flap makes hardly any difference—if anything slightly nose-up. The 30° setting brings a further slight change but the full 45° no additional load. Dumping of some 30gal of water in about three seconds, using the emergency release, produces no trim change at all—only an encouraging lifting and lightening.

One feature which I disliked was not the fault of the aircraft. By ARB mandate, the Prospector has a stick-shaker in the form of an eccentric weight driven by electric motor mounted on the stick. A vane, mounted above the wing just forward of the right aileron, turns to make a contact when airflow begins to break away and the stick then trembles sharply some 5 to 10 m.p.h. above the stall. This forms an excellent preliminary warning, but thereafter it blots out any feel of the aircraft just when one wants what stall warning the aircraft might itself provide. It cannot be switched off and judders away throughout the take-off run and during most of a demonstration steep climb. The best technique would be to fly slowly until the motor burnt out and stopped; or one could disconnect the fuse. Otherwise the device is a nuisance. The stick-shaker on the other Prospector had already given out and the aircraft had virtually no natural stall-warning, but a Safe Flight "bleeper" would have given more useful service.

On first acquaintance the Prospector is deceptive; it feels sluggish but experiment shows it to be docile and adequately manœuvrable for any normal kind of flying. The stick can be pulled hard back in a steep turn with the hopper half full without risk of stalling, power being applied to maintain over 50 m.p.h. The first rearward stick movement is effective and not too heavy, but after that the elevator reaches considerable deflection angles and becomes less responsive and no heavier. There is enough elevator to thump the tailwheel on the ground on take-off and to make a fully three-point landing at a forward c.g. Rudder is effective and light.

One particular shortcoming of the Prospector is its lateral control. Forces are fairly high (though not so high as those of a Brigadyr) and inertia or stability or cable-stretching make rapid rolling at almost any speed rather heavy going. This does no more than call for some effort and plenty of rudder in normal flying conditions, but when coming in for a new spraying run at about 100ft, completing the turn with about 60° of bank and a slight dive, one finds that full rudder and aileron effect only a slow recovery. Some anticipation is needed when attempting to line up if the intended spraying path is out of sight over the right wing until the last moment. The spray gear is simple to operate. A hand-brake must be released to allow the pump to turn and a single lever is then moved to start or stop fluid reaching the spray-boom. The system worked well at Hanover and gave no trouble. Jettisoning is certain and quick, almost completely removing a large port beneath the hopper after a light tug on a big handle in the cockpit roof. A full load would depart in a few seconds.

With the considerable drag of the spray gear, the Prospector approaches very steeply indeed at 60 m.p.h. with power off. The round-out can be easily achieved although the elevator feels slightly sloppy and brakes can be applied even before touchdown to give a very short ground run. Without spray gear the approach angle is normal. Control forces remain moderate and appreciable deflections may be required to align the aircraft in a gusty cross-wind.

On the whole, the Prospector is a useful, very versatile transport aircraft and has excellent short-field capability. It is simple, tough and not unreasonably priced for a specialist aircraft. With crisper ailerons and slightly lighter controls it would be even better value.

SMITHS PARA-VISUAL DIRECTOR (Continued from page 652)

by photographic methods that the pilot did not use a pattern of fixations to assess these clues, but stared fixedly ahead, allowing the dynamic part of the pattern to stream across his field of view. The associated theory became known as the parafoveal streamer theory, the parafovea being that part of the retina of the eye surrounding the central area of fixation vision.

First experiments involved a simulator generating a dynamic pattern of lights, such as would be seen by the pilot of an aircraft flying along a runway at low altitude. A central fixated task was presented to the subject under test, and objective recordings were taken of performance in achieving a tracking task in the presence of noise. These tests clearly demonstrated that it was possible both to comply with the tracking demands of the light patterns and also to attend to the fixated task, though some degradation was present on both, as compared to performance on either alone.

It was also found that displays of the type being employed—and several patterns were examined—proved very fatiguing over even quite short periods, and that the subject's assessment of his own performance was worse than the measured results. This particular type of pattern was therefore considered unsuitable for an instrument display. Being analogues of the type of information that would in fact be available on a genuine high-speed tracking task, these first displays were of the so-called "contact analogue" type and it is highly significant that they proved unsatisfactory.

Further study soon showed that patterns which were static in the absence of a demand signal, but dynamic when such a signal existed, might have considerable practical advantages. Because they were stationary under correctly nulled conditions it was felt that these patterns were analogues to the visual clues available to a man trying to keep his balance. If he sways forward, nearby objects to left and right appear to move backwards. To preserve balance the body must be pitched backwards, *in the same direction* as the movement of the visual clues. If he leans to the right, nearby objects ahead appear to move to the left; to preserve balance he has to incline his body to the left, *in the same direction* as the movement of the visual clues ahead of him. Even though attention is fixed on some distant object, general clues received all the time in the general field of view powerfully assist the internal organs of balance.

PVD makes use of just this principle. A variety of patterns have now been tested both on the simulator and in flight, but the most satisfactory ones have always been those most closely related to this principle. Considerable flight experience with a wide cross-section of pilots has shown that the PVD display is as nearly instinctively natural as could possibly be hoped for; and it can be used for the same phases of flight as a conventional flight director.

During fairly extensive flight trials complete approaches have been flown with the pilot deliberately looking out at an angle of more than 45° from dead ahead, and yet close-coupled instrument flight has been maintained. Under genuine day and night conditions pilots have flown accurately on instruments whilst looking out for the approach lights and have then combined PVD and external references. The problem of transition has disappeared. It is particularly significant that PVD glide-path signals are easily combined with approach-light azimuth guidance. The freedom to look around when using PVD is a completely new experience, and one that has to be tried in actual practice to appreciate its significance.

The new system is also an extremely effective monitor of autopilot control. With correct operation, the display units are all sensibly at rest; but, as soon as a malfunction develops, a compelling dynamic pattern is immediately generated with a clear indication of required corrective action.

In one test installation, signals from the automatic landing coupler were fed to the autopilot and to the PVD. Highly successful manual instrument control of the flare-out to touch-down has been achieved, the pilot being able to monitor his own performance by looking freely ahead through the windscreen. Under these conditions azimuth control in the final stages has generally been by direct visual means, so that flight control has been on instruments in pitch, and visually in roll and yaw. A number of completely blind touch-downs have also been carried out using the bank PVD display for azimuth guidance. Owing to the problem of kicking-off drift in the final stages, this technique is not acceptable under cross-wind conditions.

Objective recording of flare control using PVD has shown a remarkably consistent agreement with similar results obtained under fully automatic conditions, and the scatter of vertical velocity at impact has been consistently close to the design figure. Also, using PVD as a monitor of fully automatic landings, many take-overs from autopilot to PVD have been accomplished without difficulty during all stages of approach, and including the flare manœuvre itself.

Straight and Level

TO make a loss of £1 million and to get the headlines reproduced below is a brilliant piece of management-staff relations. But the impression which most of BOAC's shareholders (the public) might be forgiven for gaining from these headlines is that BOAC, like BEA, is a profit-making concern.

The year's results are a tremendous improvement on the previous year, when a real loss of £11½ million (not the £5 million declared) was suffered. And

B.O.A.C.'s £4m OPERATING PROFIT

B.O.A.C. makes its highest operating profit

B.O.A.C. RECORD PROFIT

B.O.A.C. EARNS OVER £4M. OPERATING PROFIT

From top to bottom, headlines from *The Daily Telegraph*, *The Guardian*, *The Times*, and *The Financial Times*

it is a fact that, on BOAC's own operations—which is what the staff at London Airport are concerned about—a profit of £100,000 was made (not £4 million, because capital interest payments are no less an operating cost than fuel, maintenance, insurance, etc.).

But it is also a fact that BOAC made a loss in 1959-60 of £1 million, and not a profit. This loss was due entirely to BOAC Associated Companies. So long as the corporation thinks it wise to invest in associated companies, should it seem to suggest to shareholders that the losses they suffer are sort of incidental?

Anyway, full marks to BOAC's PRmanship. Who can blame them for putting their undoubtedly improved results in the best possible light? I feel rather mean for removing the rose-tinted filter, and I do not want BOAC's strong recovery to be undersold. But a loss is not a profit.

I hope and believe that next year it will be a *real* profit.

● Who's afraid of the European Common Market? If anyone in Britain's aircraft industry is feeling a bit restive about the threat of combined Franco-German competition, let him consider the HFB314, Hamburger Flugzeugbau's short-haul jet airliner project *à la* Caravelle, in whose development Lufthansa are said to be more than mildly interested.

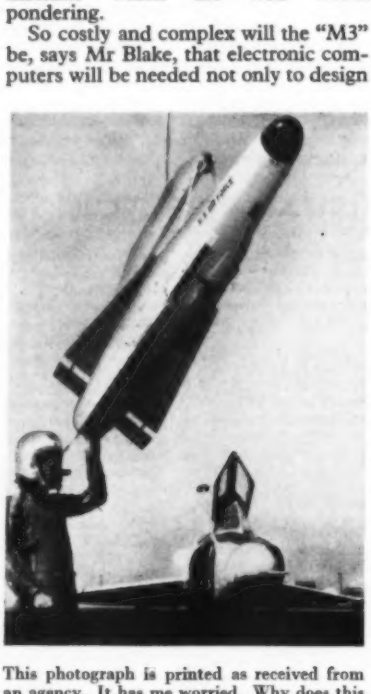
Haven't the Germans heard of the Caravelle? To project a competitor for it would be silly enough even if there were no Common Market. To do so regardless of the Rome treaty, which was drawn up on the principle that Europe must be economically united, seems to suggest a division of Common Market purpose. The Germans are also projecting a competitor for another Common Market aircraft (the Dutch-built Friendship) in the shape of the He211 project. Most encouraging.

● Some people, and I'm one of them, think that Convair may have been a trifle over-imaginative in some of their prognostications about supersonic airliners. But their manager of transport systems development, C. L. Blake, has come out with some remarks about a Mach 3 machine which are well worth pondering.

So costly and complex will the "M3" be, says Mr Blake, that electronic computers will be needed not only to design it, but to help to fly it and service it as well. Only after the characteristics of all components and systems have been fed into the computer would systems be designed in detail. Revisions would be entered as experimental results became available and as the design was refined. Finally, an electronic "reliability model" would be put into operation to simulate prolonged service.

I do hope that Mr Blake's computer is going to prove co-operative, because he himself foresees that if the M3 is delayed in service by only two hours (perhaps by a radio defect) the result will be "like a line of falling dominoes all along the airline's routes"—similar, in fact, to what happens now if twelve piston-engined transports are weathered-in at one airport.

Any advance on Mach 3?



This photograph is printed as received from an agency. It has me worried. Why does this poor chap find himself up to his torso in concrete? Did that belly-landed F-102 melt it? And what is he doing with that missile? Doesn't he realize that there's over three tons of thrust up that spout? And that there's a nuclear warhead at the other end. And that there's only a piece of string holding it up anyway. I do wish he would stop messing about with that thing. And I do hope someone comes and pulls him out. And jacks up his F-102. He could find himself in real trouble

● Do you remember the plaintive *Flight* leader the other week about Transport Command and Exercise Starlight? "Too Little, and Rather Late" it was called; and it asked, "What sort of fire brigade is it that takes 38 days to get its appliances to the conflagration?"

Reading it one yearned for the might of MATS—sinecure of military transport services, the best and the most. At least I thought it was until I read that Lt-Gen William Tunner, the head of MATS, has declared that 90 per cent of MATS aircraft are obsolete; that the Command's airlift force "cannot meet the time limitations established for the airlift of army forces"; and that in last month's transport exercise between the US mainland and Puerto Rico the lift took 4,000 hours longer than had been planned.

A jolt such as this is a healthy reminder that the grass isn't always greener on the other side of the Atlantic.

● *British offer to foreign government:* "If you are interested in this fighter we will keep the project going for another six weeks while you make up your mind. But please pay us £40,000 for the employees' wages."

American offer: "If you buy this fighter we will put $10,000,000 into its development for your specific requirements."

Guess who will finally foot the $10,000,000 bill . . . and how many other countries will follow suit and buy the same fighter . . . and whether the first licence-built version will fly within a year of the target date.

Not For Crop Spraying?

● "The DC-8 was designed specifically for passenger service"—United Air Lines advertisement.

ROGER BACON

THE author of this special article for "Flight" is BOAC's technical consultant on the US West Coast and is also the corporation's plant representative (as this highly responsible post is designated) at the Boeing factory at Renton, which is some five miles from the main Seattle plant. Appropriately for the task he has to perform, Mr Lusty has an engineering and legal background. He received his engineering training in England and holds a BSc(Eng) degree with honours from the University of London; he also has a University of Washington LlB degree and is an attorney-at-law. He is a Member of the Institute of Mechanical Engineers and of the American Society of Mechanical Engineers. Mr Lusty appears in the picture on the left, the caption to which is at the foot of column 2.

PLANT REPRESENTATIVE

BY IVOR LUSTY

Monitoring BOAC's £25,000,000 Boeing Order

ONE is frequently asked about the nature of the functions and duties of the plant representative's office in connection with the purchase of a fleet of aircraft such as the 15 Boeing 707-436s, the first of which has been delivered to British Overseas Airways Corporation (the subsequent 14 will now follow in rapid succession). Obviously, there must be a lively monitoring when £25,000,000 is being expended in new equipment of this kind. How is this done? The nearest analogy to a plant representative's office would be the clerk of the works office when some civil engineering undertaking of comparable magnitude is in progress. Additionally, because here a national corporation is dealing with a corporate giant in another country, the plant representative's office becomes a kind of technical consulate.

Boeing now has a total of 16 customers in its 707 programme and to accommodate the representatives of these airlines some 10,000 sq ft of office space is provided in their administration building. The signs over the doors look like a little United Nations! Additionally, office space conveniently located to the production line is provided for each airline's inspectors, and in the delivery center—where final inspection, purchase, and fly-away procedures are completed—there are offices, stores, crew rest rooms, briefing and flight planning facilities, etc.

The BOAC representation is unique in the accumulated experience which it brings to the job. The plant representative first arrived at Boeing in 1946 to buy the corporation's fleet of Stratocruisers. In the years between he was engaged on the Canadair 4 and acted as plant representative at the Douglas Company for the Seven Seas purchase. Assisting him is Hugh Hambling, who also was on the Stratocruiser contract, and John Collins and William Dyer, who have held the posts of liaison engineer and electronics specialist respectively on both the Seven Seas and the Boeing 707 procurement programmes. In addition to the usual complement of secretarial staff, there are seven inspectors covering the various fields of structures, engines, electrics and electronics.

In spite of the acute security-consciousness in the American industry the alien groups attached to the offices of the overseas customers are accommodated with surprising smoothness. Security in American aircraft plants is not self-imposed but is set up by the Services involved (e.g., by Navy at Douglas and the Air Force at Boeing) but, by judicial separation of the work processes and screening of the persons involved, practical working arrangements are achieved.

The responsibility of the BOAC plant representative's office is directly to the corporation's chief engineer in London, Charles Abell, from whose office originate the major decisions in connection with the project. The distance causes little or no inconvenience. The transatlantic co-axial cable has greatly improved telephone connections for discussions of complex matters and the BOAC telex circuits are also extensively used. Properly exploited, the time differential is a great help. Inquiries emanating from one end get dealt with overnight at the other and the reply is available in the morning. In the aircraft construction business, where inertia and momentum tend to be endemic, this kind of quick-fire action is stimulating and appreciated.

Contract Negotiations When in late 1956 the decision was final that the Boeing 707 was the aircraft to be ordered, the technical and legal staffs of Boeing and BOAC conferred in London. From their many discussions and bargainings there were distilled the two documents essential to the contract. These are the purchase agreement and the aircraft specification. The price and delivery terms in the former are based on the aircraft described in the latter. This was the basic aircraft (in this case the 707-420) for which the Boeing Company had a basic price, changed by the introduction of as many of the airline's special requirements as had already been studied and priced by Boeing. The aircraft so defined was designated the 707-436, which became the model special to BOAC. Both in the purchase agreement and the specification there are innumerable "fronts" on which there is bargaining to be done, and giving and taking. Only after a great many hours and weeks of accumulated work does something like a semblance of a package deal begin to emerge. Finally, when the minds meet the agreement is signed.

In the case of the Boeing/BOAC contract for the 707-436 there were interesting phases over and above the usual ones of delivery, price, payment schedule, certification, warranties, tort liabilities, spare parts, training, etc. The aeroplane was to be fitted with Rolls-Royce engines and the relationships between Boeing, Rolls-Royce and BOAC had to be explored and defined. Also, it was to be delivered with a CAA Certificate of Airworthiness for Export and this required clarification of the relationships between Boeing, CAA, ARB and BOAC.

It was agreed that Boeing would be the prime contractor, buying the engines from Rolls-Royce and taking the full responsibility of certifying and selling to BOAC a complete aircraft. In order to keep responsibility and authority together the corporation has no direct contractual relationships with Rolls-Royce, and this had provided a discipline which all parties have appreciated and which might well be a model for future similar transactions. Obviously, because of the proximity of the two English companies a close measure of liaison has existed, but anything in the nature of design criticisms or changes have been handled through Boeing, who have their own privity of contract with Rolls-Royce on matters of specification, changes, warranties, price, delivery, etc. As a matter of convenience and as a saving in dollar expenditure BOAC has been making certain payments to Rolls-Royce. These payments, in sterling, have been made on behalf of Boeing, who credit the corporation in dollars against the price of the aircraft.

Another area which presented interesting features was the certification procedure. In the purchase agreement Boeing undertook to have the CAA (now FAA) certificate the aircraft in such form that the Air Registration Board would automatically validate the certificate. In this they assumed a calculated risk of serious magnitude, for not only were the regulations of the CAA and the ARB not well understood but there was an almost certainty of material changes taking place between the date of the contract in November 1956 and the certification date in December 1959. In the matter of CAA certification and ARB validation it was agreed that BOAC was not directly involved but that their best

G-APFD, third of BOAC's Boeings, was the first to be handed over (at Seattle on April 27). In the above group at the informal ceremony are, l to r, Bill Carlyon and Tom Spalding of Boeing Transport Division's contract administration department; Ivor Lusty, BOAC plant representative; Serge Gorney, product co-ordinator for the Transport Division; Charles Abell, BOAC chief engineer; J. L. Uncles, 707 project engineer; Capt H. J. (Dexter) Field, BOAC special technical-duties pilot; and Tom Gillan, BOAC inspector

Now with a modified fin (page 637, "Flight" last week) the first 707-436 is seen shortly after its 4,900-mile non-stop delivery flight to London Airport on April 29 in the hands of Capt Tom Stoney

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efforts would be available as necessary to achieve the desired results.

The plant representative was, of course, engaged in the negotiations leading to the contract and collateral agreements, and from that point on his office at Boeing's Renton plant was fully deployed.

Post-contract Changes Every change made in an aircraft specification during the production sequences is a matter of importance. It is obvious by the nature of things that during the contract negotiation period final and detail specifications cannot be drawn to cover every point. Many requirements must be negotiated after the signing of the contract to reflect changes not yet studied and priced at the time of the contract, or customers' afterthoughts, or important improvements in the state of the art. Some of these change requests are welcomed by the constructor and he provides mock-ups and other assistance to the customer; others he resists. It is the responsibility of the plant representative to bring these changes up to the stage for acceptance and incorporation in the specification and to advise as to the possibility and practicability of their incorporation *without prejudice to the delivery date*. He must develop a sensitivity to the manufacturer's potential to absorb these changes without slipping on the programme, so that his airline gets the most advanced aircraft possible, *but with timely delivery*.

Because of the relentless course of the aircraft down the production line, some changes are impossible of accomplishment on the early products but could be incorporated on the later ones. "Split effectivity" is the appropriate jargon. The plant representative's judgment is important in the decision to accept split effectivity. Is the split as early as all reasonable efforts can accomplish? Is it possible of easy accomplishment as a preservice modification? Are modification kits to be available? If so, what are the conditions of delivery and price?

Some important changes have occurred during the production of the 707-436 by reason of advancement in the state of the art, and substantial benefits have accrued to BOAC. The performance of the Conway engines has increased markedly during the period. Not that the aircraft has had to rely on this increase to meet its guaranteed performance; the increased performance resulting from the Conway improvement is a clear bonus. Also, ultimate-load tests on the 707 structure showed useful margins over the design figures, so that by the mere incorporation of a heavier landing gear the all-up-weight was increased from 296,000 to 312,000lb. This again was a bonus attained at only the cost of the gears and 314lb of extra tare weight. The effect of these two improvements is still further to increase the earning potential of the aircraft, and whereas all operators are beneficiaries of the increase in all-up-weight, the benefits of the engine improvements are limited to Conway users. They can expect operations to show a 2½ to 3 per cent fuel economy as compared to the competitors, with valuable flexibility in flight planning due to the sustained power at high altitudes.

Other typical changes arriving from technical progress are the incorporation of an engine vibration and temperature monitoring device, provisions for dual Doppler navigation equipment (by Marconi), and installation of the Marconi teleprinter for in-flight receipt, in plain language, of *en route* weather.

The third category of changes to the specification are those brought about by necessity of time to finalize. In some cases the manufacturer has not been able to complete his studies and pricing; in others the airline has been unable to complete its operational or traffic forecasts. To wait for completion of these studies before closing the contract might prejudice the customer's position on the delivery line; to be precipitous might be to be placed in the position of a captive customer. A delay of even a few weeks in closing the contract might ultimately risk a lengthy postponement of deliveries in favour of a competitor. These decisions are not easy and are made possible only by abundant good faith.

Of a total of 130 changes negotiated to the BOAC Boeing specification, only 11 have split effectivity and none has affected the delivery dates of the aircraft.

Customer-furnished Equipment In the matter of customer-furnished equipment, serious responsibility rests on the plant representative's office. Many items on the 707-436 are customer's choice and customer's supply. The list includes all the communications radar and communications equipment, the galleys and auxiliary catering installation, the seats, emergency equipment and, of course, all items of a passenger-amenity nature.

If the manufacturer is to meet his delivery obligations he must set up for each item one deadline for the supply of full and irrevocable technical information, including requirements for envelope, mounting, functional testing, inspection, etc.; another deadline for receipt of a fully operational sample; and, thirdly, a series of

on-dock dates by which the pieces of equipment must be available for entry into his materiel systems to meet the aircraft production schedules. The facts of life being what they are, and through no fault of BOAC these deadlines were not always met. Here is an area of difficult negotiation—an area where hard cash penalties are involved, and where an aircraft manufacturer with a reputation for on-time deliveries has earned the right to be tough and usually is. Nevertheless, the first 707-436 has been delivered complete with the exception of one item, not of British manufacture, and timely delivery of which could not reasonably have been contemplated.

Some Other Bought-out Items As explained earlier, the Conway engines were not to be customer-furnished equipment. Nevertheless, Rolls-Royce Ltd were required to work to an "on-dock" schedule for their deliveries into the Boeing plant. Precision planning, however, was set at naught by the fire at the Rolls-Royce facility at Mount Sorrell and a recovery programme had to be initiated. The first six engines for the test programme had been air-freighted from London to Seattle and this, fortunately, provided the pattern and the experience for air freightage of the later ones. This gained six weeks of valuable time. At the Rohr plant at Auburn, near Renton, where the powerplants were being assembled and American items being installed, the flow time was drastically reduced; and finally Boeing revised their aircraft assembly sequence to accept a later input. Although BOAC only encouraged all this from the sidelines (and cajoled here and there), they take a Britisher's pride in the way the programme was salvaged for the benefit of all.

Another item not strictly customer-furnished, but in which BOAC and their representative have taken a hand, is the tyres with which the aircraft are delivered. To maintain a competitive situation and to insure against dislocations in supply, Boeing procure their tyres from several sources and fit them to production aircraft by random withdrawals from stores. For BOAC a deal was set up under which the corporation paid in sterling for all tyres to Goodyear at Wolverhampton; Goodyear at Akron provided tyres free issue to Boeing, and Boeing credited the corporation dollars against the purchase price of the aircraft. BOAC thus economized on their dollar expenditure and at the same time received tyres of their choice on their aircraft.

When British material is imported into the USA for incorporation into an aircraft which will subsequently be exported, the duty on the material is paid and, when exportation is made, 99 per cent is recoverable under the drawback procedure. The stores accounting is laborious; the time to recovery can be many years; no interest is payable on the sequestered funds, and 1 per cent of the duty is charged to boot. In the case of the Conway engines some $2¼ million would have been lost to the corporation's use during this period. Accordingly, combined efforts were made by Boeing and BOAC to have the controlling statutes revised; and in April 1958 the Congress passed a bill which permitted the importation of the Conways upon posting of a bond of quite nominal size. The savings to the corporation in interest, documentation, and control have been substantial indeed.

The passage of the Bill has a still larger significance. It indicates that the United States has come a long way from isolationism into the world of reciprocal trade facilities.

Certification The United States and Great Britain enjoy reciprocal agreements signed and effective in 1934. Aircraft manufactured in one country and certificated in accordance with the airworthiness requirements applicable there will get validation of the Certificates of Airworthiness for Export on entry upon the receiving country's registry. The receiving country reserves the right to make such validation dependent upon the fulfilment of any special conditions which are for the time being required for issuance of C of A under its own rules.

The 707-436s for BOAC are certificated under these agreements. The FAA, in issuing these Certificates of Airworthiness for Export, will be certifying that the aircraft would qualify for an American C of A if this were requested. Also, as an expression of comity, they would not issue the certificates until they had assured themselves that the special conditions raised by the ARB had been met, and that the validation by the British authority would follow as a matter of course.

The special conditions include several major sections of the current BCARs. Many of the special conditions were found to have been met by the adequate design-margins already in the aircraft, while others—such as the installation of the crash switches called for—were straightforward and relatively simple design-changes. (This particular requirement remained in until about two months short of delivery, at which time it was withdrawn.) Some areas, however, have been particularly troublesome owing to the differences in philosophy between the experts of the FAA and the ARB; but even here, during the progress of the work, there has been a certain converging of viewpoints.

In the take-off regime differences of test methods were acute and it became necessary to repeat much of the test work at a high cost to BOAC. The differences in final results will probably be small, and the differences between the most liberal and the most conservative results (whichever way round it happens to be), will probably be within the safety margin provided by either. The results prove neither method right nor wrong in an absolute sense,

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but the extra tests and the analyses therefrom must be considered as interesting research endeavours.

The autopilot also provided scope for the effect of dual certification. The installation consists of an electronic system with a comparator unit (virtually a second autopilot) which exercises a checking function. When autopilot and comparator agree they work in harmony. If, as a result of a failure in either, they should disagree they are both instantly disengaged and the aircraft is returned to the control of the human pilot. Such a system may be justified either by analysis of all possible faults to prove that nothing could fool one or both of the units, or by tests showing that hazardous flight conditions are not created by the worst faults possible. Boeing adopted the latter method, but the FAA and the ARB failed to agree on the number of seconds which should be allowed to elapse, on test, between the occurrence of a simulated failure and the pilot taking corrective action. This has necessitated considerable additional testing.

Finally, there was the matter of timing for the introduction of certain product improvements on which Boeing have for some time had an active programme. These were in the areas of ability to trim-out in certain conditions of asymmetrical power; pilot's rudder-bar feel; and the long-period divergency of dutch roll if left uncorrected and with automatic yaw damper off. The FAA has been closely integrated with this programme and are seeking introduction of this package of improvements as soon after approval as reasonably possible. Their experiences with the aircraft, and knowledge of it, undoubtedly justified this position and over 80 aircraft of the general type are in commercial use in passenger carriage. The ARB, however, judged these improvements to be so basic that they demanded their approval and introduction as a condition precedent to validation of the certificate.

These kinds of differences of opinion can be expected between any two groups of competent experts, and although in the certification of the 707-436 they have persisted to our cost and delay, it is not too much to hope that in the future the requirements may become asymptotic to the truth.

The effort of designing, building, testing and certificating an aeroplane under the FAA or ARB is rather like designing and building a yacht for racing, but for racing in which the handicap rules may be changed at any time. To a marine architect this would be an impossible task, but the aircraft constructor has to work in this environment all the time. He also faces the problem —which is not unique—of dealing with an administrative agency in a technical field where the agency acts as both lawmaker and judge, where there is no effective appellate procedure, and where the agency holds the right to change the rules at any time. The 707-436 has satisfied two such agencies simultaneously.

BOAC Out-station A BOAC badge and a British accent are fairly common phenomena at Boeing. It is three years since the contract for the 707-436 was closed and many staff members have been called upon to make duty visits to the plant. San Francisco, a mere 800 miles distant, is now on a BOAC route and travel from London to Renton is convenient and swift.

Many full-scale mock-ups were provided by Boeing. First a space mock-up of the cabin accommodation utilizing cubist elements to represent components such as seats, galleys and toilet fittings; then later a finished cabin mock-up presenting decor and many details. At another time a full-scale cockpit mock-up was prepared to finalize instrument array, cockpit lighting, control details, seating accommodation and such like. Each of these mock-ups, and several more, were occasions for visits with long discussions and arguments by BOAC specialists. At the most important sessions the chief engineer himself presided.

On the 707-436 programme it was considered economic to do spares provisioning at London instead of at the Boeing plant.

Harold Abling, assistant manager manufacturing, Boeing Transport Division, discussing the Rolls-Royce Conway powerplant of the 707-436 with the author (right). Guaranteed thrust is 17,500lb per engine

BOAC provisioners are acknowledged experts in their field. The lists of parts provided by the manufacturer can never be completely "jelled" until the first aircraft is finished and certificated; but from the interim data, covering some 22,000 items, they must select those things and the corresponding quantities which are compatible with BOAC's planned operation. Many discussions precede co-ordination of the methods of presenting and communicating the information, the timing of the orders for various categories of parts and the sequence and mode of shipment. This cannot be achieved by remote contact and there were many visits of BOAC personnel to Renton and Boeing personnel to London.

The Boeing ground school alone attracted 208 corporation students, who received a total of 16,000 free class-room hours' instruction. Many of these returned to London to form the nucleus of the corporation's own 707 training establishment. Others were involved in the co-ordination necessary for the manufacture of the Link simulator now assembled and operating at London. Six crews trained in this simulator have since returned to Boeing for flight training prior to delivery of the first aircraft.

BOAC's inspectors have also become respected visitors to the Boeing plant. The first group were drawn from the corporation's base at Idlewild, New York, and their acquaintance with the 707 enabled them to return there to take care of the early Qantas 707 operation. The subsequent group, headed by Tommy Gillan, will stay through till the end of the contract. Under the direction of the liaison engineer they must "kibitz" the production for quality and also check the product for specification conformance. It must be exactly as prescribed in the aircraft specification.

The performance of the aircraft in relation to the specification has been checked by Capt Dexter Field, who has earned a high reputation amongst the Boeing test pilots.

The BOAC resident team are the watchdogs for quality and performance. They serve the corporation well. To recognize the just-possible and insist on it is as important as to recognize the impossible and forego it. To be right and reasonable, yet firm, engenders respect and builds that goodwill which is essential to the continued success of such a programme as this for many years when all the aircraft are delivered and all the warranties are time-expired.

USAF "AT HOME"

TOMORROW (Saturday) the Lockheed F-104 Starfighter is making its first public appearance here when it takes part in a display at RAF Bentwaters, Suffolk, marking USAF Armed Forces Day. Bentwaters is one of nine RAF stations in Britain used by the US Third Air Force which are being opened to the public in this year's Armed Forces Day observances. No 111 Sqn are also performing there and at Sculthorpe (Norfolk) on the same day.

The celebrations are being spread over three weekends, starting on May 14, when Bovingdon (Herts) will be open in addition to Bentwaters and Sculthorpe. There are to be special functions at Mildenhall (Suffolk) on May 21 and at Bushy Park (Middx) on May 22; and six bases will be open on May 28—Wethersfield (Essex), Lakenheath (Suffolk), Bruntingthorpe (Leics), Chelveston (Northants), Alconbury (Hunts) and Prestwick (Ayrshire).

MARCH EXPORT RECORD

DURING March the British aircraft industry's exports reached the highest total ever recorded for that month—£15,713,232; it was also the third largest monthly figure ever achieved. This brought the total for the first three months of this year to £39,340,339, which was the fourth highest quarterly figure ever attained by the industry.

Engine sales were prominent in the March and quarterly totals. The January-March figure of over £17½m was a record and the total for March—£7.3m—exceeded by £1m the previous record monthly figure (in October last year). Airliners have also figured prominently in recent overseas sales, announcements that TCA and Aden Airways had ordered three more Vickers Vanguards and three Avro 748s respectively, bringing to 21 the number of airliners sold to eight airlines abroad during the past six weeks. Total value of these orders amounts to some £17½m.

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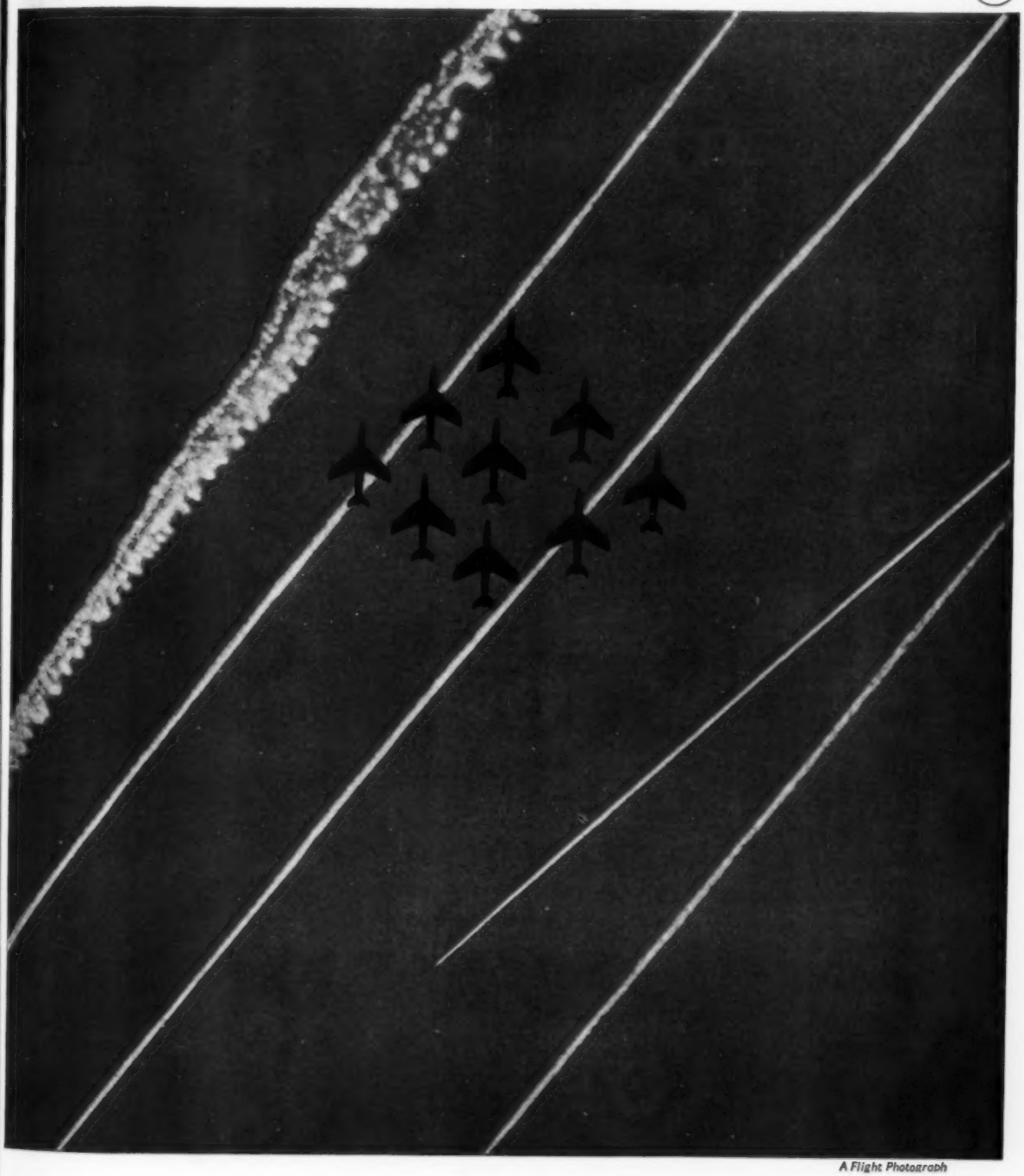

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The Final Act?

A REVIEW OF THE NEW CIVIL AVIATION LEGISLATION IN ITS FINAL PHASE

BY J. M. RAMSDEN

IT has been absorbing to follow the passage of the Civil Aviation Licensing Bill through the House of Commons. The first debate (second reading) took place on March 2, and thereafter the House got down to the detailed discussion of amendments, tabled by the Minister and by members, in four sittings of Standing Committee B between March 17 and March 29 (the committee stage). At length, on April 28, the amended Bill was presented to the House by Mr Sandys (report stage) for its third and final reading.

A good many amendments have been incorporated, and the Bill —which will now go to the House of Lords—is in a number of respects improved. In its original form it was reviewed in *Flight* for February 26. Six main criticisms were made in that review, the most important of these being that the Air Transport Licensing Board which the proposed Act is to establish will not be the powerful autonomous body that is needed. Instead, we submitted, it was in danger of being a mere puppet of the Minister, whose powers over the proposed Board appeared to us to be much too great.

Our six original criticisms are recapitulated in bold type below. Of these, five have been the subject of amendments and have, in varying degrees (three wholly and two in part) been met.

One of the two basic shortcomings, *Flight* contended, was that—

1. "Though domestic fares will be controlled by the Board, international and cabotage fares will not. . . . The Board as proposed will have no powers at all here, and no mandate to raise its voice if it considers that IATA's policies are not in the economic interests of Britain's air transport industry."

During the second reading the Minister said on this score: "It would be inappropriate, also not practicable, for the Government to delegate the control of fares to any other authority." Not very promising. But during the second sitting of the committee our hopes leapt to hear him say that he intended to propose an amendment to the effect that "the Board should initiate proposals for international fares." It seemed that the Board was to be invested, quite properly in our view, with an important degree of influence—even if not statutory control—over international fares.

When the Minister's amendment finally appeared it was not too clear to what extent the Board *would* be thus brought, as the Parliamentary Secretary (Mr Rippon) said, "rather more into the picture" on international fares. As the Bill stood originally [2.5(b)] the Minister was to fix external fares, and that was that. As amended, the Board will now be able to propose changes in external fares.

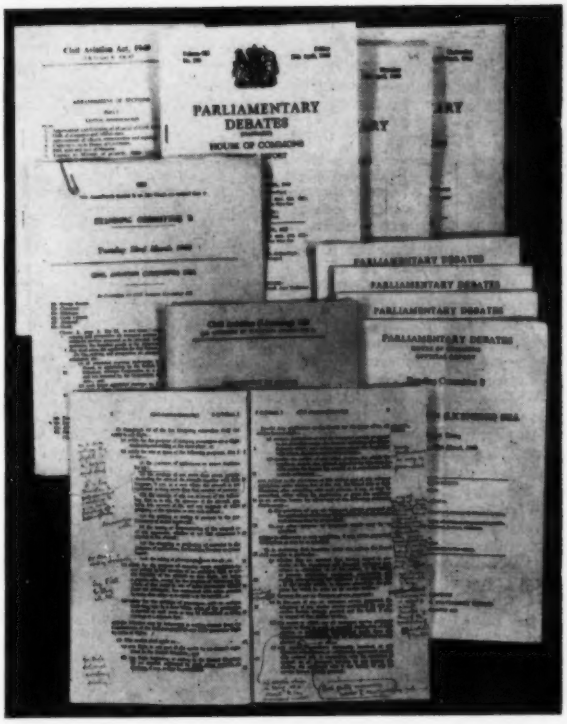
The Minister's intention (we quote Mr Rippon) is that the Board "will fix international fares in the first instance on the basis of approved IATA fares. There may be circumstances in which the Board recommends a change; but that of course would be subject to appeal and there is nothing in the amendment which undermines in any way the Minister's ultimate responsibility for international fares."

So far as IATA fares are concerned, therefore, there now appears to be some scope for a good Board to make its influence felt. But, as the Parliamentary Secretary said, "there is of course nothing in the new amendment to require any British operators, either corporations or independents, to get the view of the Board before proceeding to the annual IATA discussions or to obtain the Board's views on fares when IATA has fixed them."

No, there is not: nor is there anything in the amendment to prevent the Board making its views known in this respect. It is to be hoped that it will do so. Mr Rippon incidentally betrayed the weakness of the Government's influence over IATA when he said that IATA "fixes" fares. IATA only recommends fares: it is Mr Rippon's Ministry that should fix them.

The amendment was probably introduced mainly with the intention of giving the Board the power to determine cabotage fares. If it also provides the Board with the opportunity to influence operators and the Minister in respect of IATA's fare-fixing practices it may be considered to have improved the Bill.

2. "The Bill proposes that if, in the opinion of the Minister, an application might call for the negotiation of traffic rights which the Minister considers 'inexpedient to seek,' the application should be refused 'forthwith. . . .' Traffic rights are an integral part of air transport, and the regulatory authority should have explicit powers to initiate policy and to interpret agreements."



Nearly 20 hours have been devoted by the Commons to debating the Civil Aviation (Licensing) Bill, all the relevant documentation being assembled in this picture. The Lords will now debate the amended Bill, which may be expected to become law in June or July

Only once during the passage of the Bill through the House was this second basic shortcoming mentioned. The Minister said during the second reading: "I think that it will be agreed that it would not be right for an outside body such as a licensing board to put the Government under an obligation to open negotiations with foreign governments if they do not think it wise and opportune to do so."

Without the power at least to initiate policy in regard to traffic rights, which are the very lifeblood of air commerce, the Board is bound to be enfeebled. It is curious indeed that the House could occupy itself interminably discussing, for example, the alleged evils of skywriting or the definition of a hovercraft while never once discussing the Board's need to have influence over traffic rights. At the least the matter ought to have been debated. Let us hope that it will be in another place.

3. "One of the matters which the Board must consider in particular is. . . . 'Any observations made to the Board by the Minister. . . .' How often, one wonders, will these powers of intervention be exercised?"

This item in the Bill, the embodiment of our contention that the Minister was retaining unreasonable powers of interference, has been removed. Its deletion was accepted by Mr Sandys, who said: "If the Minister made too many observations too often, it would tend to weaken the independent status of the Board."

Supporters of the Board's independent status can raise a cheer at the deletion of this item. But it should not be too hearty; for tucked away in another part of the Bill is a clause which *could* give the Minister as many opportunities to make "observations" to the Board as would the deleted 2(2)(g). We refer to 4(1), which rules that it shall be the duty of the Board "to consider any representation from *any person* [our italics] relating to, or to facilities in connection with, air transport services . . ."

This was in the original Bill, and it remains in the revised version. Its implications escaped us because we did not know (our ignorance was shared by the committee) that, to quote Mr Rippon, "in every Act of Parliament in which we use the word 'person' that word legally includes the Minister."

In other words, as Mr Strauss noted, "it seems that the Minister has a right to make observations to the Board on a very large range of matters." Being on the Labour side, he did not object to this—but he made the enlightened suggestion that "if the Minister should exercise that right, there should be an obligation on him to publish the observations which he makes to the Board, so that everyone knows what they are."

[*Continued overleaf*

The Final Act? . . .

Mr Strauss's voice is often raised whenever he detects a potential lack of public accountability. Mr Rippon sidestepped this particular plea: we strongly believe that he should have considered it.

4. "Among matters which the Board must 'consider in particular' when issuing an air service licence are not included (a) the public interest and (b) the general expansion and promotion of British air transport. . . . Nowhere in the Bill in fact is there to be found any definition of the Board's purpose."

In remarking upon the absence of any such directive we had in mind what, in our belief should be the essential purpose of government regulation—protection (or promotion) of the public interest. The public interest may or may not call for the protection of this or that section of British air transport. The point is that the industry should be regulated (as it is in the US, Canada and Australia) by a government agency which regards the brass tacks of its job as the protection of public interest first and foremost.

Without doubt the worst aspect of the new legislation is that this point is ignored completely. One member, Stanley McMaster (Con, Belfast East) proposed that one of the things that the Board should consider in particular should be "the advancement of British aviation throughout the world, the interests of the travelling public, and the reduction in the cost of air transport."

This was good so far as it went. The Minister agreed that "nowhere in the Bill is there any statement of the general objectives of the Board," and he said he would "consider introducing an amendment on those lines." This he did not forget to do, for at the report stage before the third reading he asked for the insertion of a sentence at the end of [1(1)] defining the general duty of the Board as "furthering the development of British aviation."

Fair enough, one might have thought. Yet, when Mr McMaster moved this amendment, Richard Marsh (Lab, Greenwich) alleged that "for sheer platitudinousness it would take some beating." He went on to declare that the Bill's purpose was "to safeguard the interests of a small group of independent airline operators," and suggested that this amendment showed how the Tories were trying "to advance the interests of themselves."

Wasting the House's Time

Mr Marsh is a newcomer to the House, so he does not know how dreary and sterile this doctrinaire approach to British air transport can be. To seize on this politically neutral proposal, and condemn it in party political terms, was in our view a wearisome waste of the time of the House. Even Mr Chetwynd (Lab, Stockton-on-Tees), who contributed valuably to the discussions—in fact nearly all the best points were made by Labour members—lapsed here.

During the third reading he wanted to amend Mr Sandys's amendment. British aviation should be advanced—he agreed with that, "provided that this will not be to the detriment of the present or future activities of the air corporations." All the implications of these words had been Laboured again and again during the preceding proceedings; yet Mr Chetwynd went through them all once more. And Mr Rankin (Lab, Glasgow, Govan) did too, declaring that the hon Members opposite were "paid retainers" of the independents trying to get the Bill through the House "in the interests of the private independent airlines for whom they speak." He was called to order by the Speaker.

But points of order apart, all that was being proposed was an addition to the first sentence of the Bill charging the Board with the duty of "furthering the development of British aviation." No mention of any duty to protect the public interest—just a general directive about advancing the interests of British aviation. The Opposition missed the point of a Government amendment which missed the point.

5. "The Bill makes no provision for the proposed Board to conduct its hearings in public. . . . It is important that not only should hearings be held in public, but also that the public and the industry should know the reasons for negative decisions."

Nowhere in the Bill is there provision for the hearings of the Board to be in public. We have the Minister's assurance that this will be so—but with the vitiating qualification that "it may be necessary to hold private sittings from time to time, for example if issues affecting international relations are being discussed." The number of times when an application will involve the discussion of international relations could, as we have suggested before, be very large. Does this mean that the majority of the Board's sittings other than those in respect of domestic applications will therefore be in private?

As the law will stand, unless the Lords persuade the Minister otherwise, the Board could very easily become a secret court, like the present ATAC (whose original function was to consider representations of the public, yet which became a *de facto* licensing authority whose every sitting has been barred to the public and the Press). Secret tribunals are alien to the British way of doing things. As the old saying goes, if justice is to be done it must be . . . well, there is no need for us to complete that truism.

It is apposite here to quote a remark made by a pilot in these pages not so long ago (*Flight*, April 1). Speaking of accidents, one of several aspects of British air transport in which the secrecy cult is highly developed (examples: pool agreements, corporation financing of equipment for foreign operators, jet noise, etc.), he said:—

"There is a tendency, from the Government downwards, to assume the responsibility of 'protecting the industry. . . .' Whatever justification there might have been in the past for the protection of a young industry this no longer applies and the privilege which the industry has hitherto enjoyed should be more closely regulated. . . . It is timely for the United Kingdom to make this re-appraisal and so prevent the interests of a small but important group from slipping under the cloak of a technocracy which lacks the check and balances applied in other fields of our public life."

Facts and Figures Needed

6. "The Bill gives the proposed Board no power to call upon the airlines for full financial and traffic statistics and for information about equipment transactions and commercial agreements with other operators. The collection and dissemination of statistics should be an important function of the Board; without this information the true state of the industry is concealed . . . misrepresentation is possible and decisions are made and policies are shaped on the basis of inadequate knowledge. . . ."

The greatest and most widely acknowledged weakness of the ATAC has been that it has made decisions on complex economic and commercial issues without checking the evidence for itself. Mr Sandys agreed to a proposal by Paul Williams (Con, Sunderland, South) that he should make provision for applicants to furnish information relevant to their applications. Actually, he went further: there is now provision for all operators, air service licence holders or not, to supply general "statistical or other information" on their operations [5(2)(b) and (c)]. It is to be hoped that these statistics, which will lighten much darkness, particularly in respect of independent financial results and non-scheduled operations, will be published so that the public—and the industry itself—may know how British civil aviation is getting on.

The only question is whether the Board will have the staff to analyse these data for itself. It is a splendid thing to have "men of wisdom and experience" (as the Minister visualizes these as yet unappointed Solomons) listening to and deciding applications. But this is not enough: their judgment must be backed by independent staff work. It would be equally splendid to have a Board staffed entirely by Wheatcrofts—but this might also be out of balance. A mixture of the judicial and the analytical is needed. Yet, as matters stand, the Board will comprise "men of wisdom and experience" (incidentally working in two groups with the danger of discontinuity). But it is encouraging that the data will be available to the Board. Let us hope that they make good use of it, and that they will publish it for others to make good use of.

Access to Pool Agreements

Particularly encouraging is the opportunity which the Board may now have of inquiring into the nature of commercial agreements entered into by British operators. These agreements are among the matters which the Board must "consider in particular" before granting air service licences. Under the Minister's amendment [5(2)(c)] introduced on the third reading the Board may now be able, under regulations made by the Minister, to call for "statistical or *other information* [our italics] with respect to their operations."

Obviously the Board cannot consider in particular "commercial agreements" (a euphemism for pool agreements) unless it has some knowledge of the nature of these agreements. This is a very important amendment, because it means (intentionally or not) that pools will not be the sacred secrets that they have been in the past. The new Act will not necessarily therefore protect the practitioners of these cartels which, but for those vital words "other information" in 5(2)(c), might easily make a mockery of the Board's authority.

We believe that the Bill is now a much improved piece of legislation. The Board will still be sadly underpowered; but a great deal depends on the calibre of the men appointed to it, and the commonsense with which they and their colleagues in the Ministry, in the best Civil Service traditions, interpret the rather cramping provisions of the new Act.

It is to be regretted that no one thought of caring first and foremost for the public interest, and that the outdated protectionist principle of aviation's self-interest is to be enshrined in the first sentence of the first clause of the Act. But we hope that the compensating corrective of public accountability will be applied in full measure.

Sport and Business

Summer scene, 1960 vintage: three D.H. Chipmunks of the London School of Flying in formation near Elstree Aerodrome. They are being flown by John Schooling (the CFI), Stuart Craft and Janet Ferguson

DETAILS HAVE BEEN GIVEN by the Rotorwing Aircraft Co of Birmingham, Ala, of their Sportsman autogyro, a photograph of which was published in *Flight* for April 29. The company was formed with the aim of offering the public a safe, reliable, simple machine, inexpensive to purchase, maintain and operate, able to fly from an area of 50ft×150ft and approaching the criterion of "going for a drive in the air." The prototype model was making its maiden flight last month, and variants are being constructed—the Pelican (for fish-spotting and other maritime duties), Grasshopper (agricultural model) and a military version.

The rotor blades are made from cedar and mahogany with steel spar; the fuselage has two main frames, one of aluminium and one of stainless steel doubling as a firewall. The tail unit comprises a boom, fin, rudder, horizontal stabilizer and tailskid; and the leaf-spring main landing gear is fitted with Goodyear wheels, tyres and hydraulic disc brakes. Powerplant in the prototype model is an 80-h.p. four-cylinder Continental C85. The Sportsman has accommodation for pilot and passenger side-by-side; the target price (as quoted on April 29) is $5,600. Maximum level speed is given as 110 m.p.h., maximum cruising speed as 95 m.p.h.

PRODUCTION of the two-seater Jodel D.112 (65 h.p.) and D.120 (90 h.p.) by the Wassmer Co has reached a total of 350 and the company say that series production of the four-seater Super IV is to start from March with an initial rate of two aircraft per month.

GOLD MEDALS were awarded to Hans Klemm, the pioneer German aircraft manufacturer, by the Royal Swedish Aero Club and the German Aero Club at Munich Museum on April 4, Herr Klemm's 70th birthday. A 1927 Klemm Kl 25 trainer was presented to the museum.

AUSTRALIAN PRIVATE FLYING STATISTICS reported at this year's conference of the Aero Club Federation of Australia show that the 25 affiliated clubs now operate 202 aircraft, fly a total of 76,449hr a year, employ 110 pilots and about 140 other staff, have an income from operations of roughly £A400,000 and get a £A108,159 subsidy (known as "financial assistance") from the Department of Civil Aviation. The clubs operate 80 Tiger Moths, 64 Chipmunks, 22 Piper Tri-Pacers, 12 Cessnas, 16 Austers and various other types including a Saab Safir. The affiliated clubs do 90 per cent of the total club flying in Australia, six clubs being outside the Federation.

The re-elected president, G. A. Lloyd, of the Royal Aero Club of New South Wales, told the conference that the two main events had been the granting of royal status—so that the Federation will in future be known as the Royal Federation of Aero Clubs of Australia—and the inauguration of an airline pilot training scheme. This was started as a trial scheme on June 1 last year, to train 14 youths for pilot appointments in the airlines. It is being financed by the Federation and the students, the only contribution being made by operators is a guarantee of jobs for graduates.

Problems facing the clubs are rising costs owing to various industrial awards, and aircraft replacement. In controlled areas, near big cities, all aircraft must be radio-equipped by next year. The clubs want a 100 m.p.h. all-metal, side-by-side two-seater for £A2,500-3,500. The only possibility (writes a correspondent) is the French Rallye or an aircraft from Poland or Czechoslovakia: the solution will probably be a more expensive Cessna, and fewer of it. "It is a tragedy," he adds, "that the British industry has ignored this universal requirement; there would be a big Australian market for a type like the Rallye."

PETER GLUCKMANN, who was reported missing last week on an attempt to set up a new solo long-distance record (8,885 miles non-stop from Tokyo to New York), had been crossing the world's oceans in light aircraft for the past seven years. In 1953 he flew from San Francisco to the UK in a Luscombe 8-F; and last year he made a round-the-world flight in a Meyers 200 in 29 days 6hr 52min. On his latest trip Gluckmann, aged 34 and a watchmaker by profession, was flying a Beech Bonanza. German-born, he was taken to England by his parents in 1939 when they were refugees from Nazism. He went to the US when he was 21 and learned to fly in California.

Glückmann took off from Hong Kong on April 20 and left Tokyo at 0815 on April 27, carrying 580gal of fuel on take-off

This is the cockpit of Piper Aztec G-APYX, the first example of one of the most significant new twin-engined business aeroplanes to reach England. It was being demonstrated at Kidlington last weekend; and by the time this photograph appears "Flight" staff pilots hope very much to have flown it

Ground view of the new Elliotts 15-metre sailplane, an air-to-air photograph of which we published last week. Noticeable features are the length of the ailerons, position of dive brakes and distinctive dorsal curve of the fuselage

"Flight" photograph

Sport and Business . . .

—enough for about 60 hours' flying. The last confirmed signal from him was received when the Bonanza had been airborne for seven hours.

AMONG NEW MEMBERS of the Norfolk and Norwich Aero Club is Geoffrey Rippon, MP for Norwich South, Parliamentary Secretary to the MoA.

QUOTE FROM the Edinburgh Flying Club Newsletter for April: "The clubhouse redecoration is virtually complete, and the parachute is back from the cleaners. . . ."

A D.H. DOVE, G-APVX, is being used for executive flying duties by the Leyland Motors Group and bears its "flying shield" emblem. The pilot is Capt A. W. H. Frenzel.

A PIPER COMANCHE, G-APZF (250 h.p. Lycoming), has been delivered to Lec Refrigeration Ltd, who have operated business aircraft since 1946. Previous Lec aircraft have included a Dove and an Anson.

THE 1960 EDITION of *Aviation Law for Applicants for the Private Pilot's Licence* (CAP85) is now available, according to a Ministry of Aviation information circular dated April 6. Price 1s 6d, 1s 8½d by post, the publication can be obtained from HM Stationery Offices.

A FLYING TRAINING FILM, made at Elstree by Derby Aviation Ltd, was recently shown in London. It is in full colour and depicts a pupil coming for his first lesson, being trained to PPL standard and subsequently taking his first passenger for a flight.

BRIEF DETAILS of a Russian miniature helicopter, known as the "flying motorcycle," were announced recently. Designed by Boris Aunap, it is powered by a five-cylinder radial engine of undisclosed power. Extensive use has been made of plastic materials, and the machine is described as "collapsible."

A VINTAGE PROPELLER, made by the Airscrew Company 24 years ago for a General Aircraft Monospar (two Pobjoy Niagaras), has been found in a Greenwich scrap-yard and is to be used by a US amateur constructor who is designing an ultra-light aircraft around a Niagara engine. The propeller was found by Ron Prizeman, former design consultant on the Jackaroo, who had been searching for such a propeller for the American enthusiast since 1956.

TWO TROPHIES were presented by Lord Brabazon of Tara to two women pilots at the Kronfeld Club recently. The Jean Lennox Bird Trophy, named after the wartime ferry pilot who was the first woman to receive RAF wings, went to Mrs Ann Burns of Farnborough for her flight of 5hr 45min in a Skylark 3B on May 10 last year when she covered 282 miles from Lasham in Hampshire to Bellingham in Northumberland; and the Brabazon Cup, recently given by Lord Brabazon to the British Women Pilots' Association, to Mrs Yvonne Pope of Exeter for her work as an instructor at Exeter Airport.

FIRST FLIGHT of the second prototype of the Wassmer Bijave two-seat sailplane was made recently by Gérard Tahon of the Brétigny flight test centre.

APPOINTED SOLE BRITISH DISTRIBUTOR for the Falco F.8L, J. L. Shaw can speak with first-hand knowledge of the aircraft, having recently flown back a new model from Italy. He reports that 20 are at present undergoing final assembly. The aircraft Mr Shaw flew has subsequently been equipped by A. J. Whittemore Ltd at Biggin Hill with Narco Mk V and VI, ILS, ADF and other aids.

A NEW VERSION of the eighteen-metre Skylark 3—the 3F—is now in production by Slingsby Sailplanes Ltd and the prototype is being flown by Anthony Deane-Drummond for the British team in this year's international competitions.

The company state that although in most details the same as the 3B, the 3F embodies a new design of tailplane and elevator and geared servo tabs on the ailerons. The new canopy and the cockpit arrangement using the adjustable seat back and rudder pedals as on the later 3Bs are now standard. Many detail improvements have been incorporated in re-design control systems.

The new tail unit has the same overall area as previously but is of larger span and higher aspect ratio. The proportion of fixed tailplane area has been increased resulting in a smaller elevator. The mass-balance weight is now mounted direct on to the elevator instead of being in the forward fuselage and the control system incorporates an "elevator-up" spring.

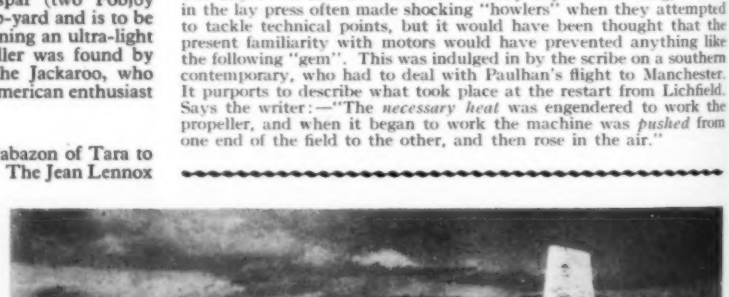
The result of these modifications has been "a considerable improvement in handling qualities." The stability at higher speeds is noticeably better and the reduced residual moment on the elevator has obviated the need to re-trim when entering turns and also the tendency to pitch nose-up when resuming straight flight.

The geared aileron tabs have given a considerable reduction in aileron operating loads and consequently improved feel. They have not reduced the rate of roll but in fact appear to have improved it.

RETROSPECT

From "Flight" of May 14, 1910

The Lay Press and Aviation: In the early days of motoring, writers in the lay press often made shocking "howlers" when they attempted to tackle technical points, but it would have been thought that the present familiarity with motors would have prevented anything like the following "gem". This was indulged in by the scribe on a southern contemporary, who had to deal with Paulhan's flight to Manchester. It purports to describe what took place at the restart from Lichfield. Says the writer:—"The *necessary heat* was engendered to work the propeller, and when it began to work the machine was *pushed* from one end of the field to the other, and then rose in the air."



A Beech Travel Air powered by Turboméca Astazous of 460 h.p. seen at the Hanover Air Show. As reported in "Flight" last week, some of these turboprop executive aircraft are being converted by SFERMA with Beechcraft support

"Flight" photograph

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Herald, Friendship and the RAAF

FOKKER'S letter in your May 6 issue gives an extremely misleading comparison between the merits of the Friendship and those of the Herald, which Stanley Brogden, your Australian correspondent, says is well-nigh identical with the RAAF's light-transport specification.

Fokker base their claim that the Herald's block-speed is 87 per cent of the Friendship's on the analysis of a 443 n.m. flight described in *Herald Facts*. This gives the Herald a block-time of 2hr 17min. Fokker claim it is 23min longer than that for the Friendship over this route. However, the time quoted for the Herald includes taxi and circuit times, whereas Fokker's analysis appears to have discarded these items.

Even if Fokker's comparison is accepted as correct—which it is not—for the RDa.7 Friendship to fly this route at 87 per cent of the Herald's time implies a cruising speed for their aircraft of 300kt—at least 35kt faster than its published performance.

Furthermore, to take such a comparison from a flight of only 443 n.m. and to apply the resulting factors to the Port Darwin-Butterworth route of 2,300 n.m. is—to put it mildly—extremely inaccurate. Fokker's analysis credits the Herald with a block-time over this route of 11½hr, whereas in fact the correct figure is 10hr 25min.

Their letter also states that the Herald's empty weight is higher than that of the Dutch aircraft. Because there is no clear definition of what equipment is included in this condition, comparison of empty weights is not conclusive. However, take-off weight—and load carrying—of the Herald is considerably greater in comparison. A small speed difference between the two aircraft is more than balanced by the Herald's greater payload.

We wholeheartedly agree with Fokker when they say that RAAF preference for the Herald is not based on performance grounds alone. In fact, it derives from the Herald's especial suitability for RAAF operations. Its outstanding handling characteristics in bad weather, its short-field performance and ability to operate from unprepared airstrips, and its high maintenance standards, fail-safe structure and magnificent record of serviceability on its extensive overseas tours are all factors which have impressed the RAAF.

These are merits exemplified by a recent report from Brazil from an airline captain, seconded from one of Britain's largest independent operators to fly the Herald on its current two-continents tour: "Simulated engine failures before unstick from awful airfields—much worse than anything I have seen before—are the order of the day. But the Herald continues its superb performance with literally no snags at all."

London NW2 S. A. H. SCUFFHAM,
Public Relations Manager, Handley Page Ltd.

The Decca/VOR Decision

YOUR "System Survey" of April 22 was most interesting and informative. As one who had to sit through a succession of ICAO conferences on this subject, however, I think that your forecast of the future could be most misleading.

The "very lives of passengers" will not be risked because of a dual system with Decca and VOR "overlaps"; in fact, it may be the best answer, and many heads of delegations at the ICAO special COMS/OPS/RAC meeting of 1959 felt that both systems could develop alongside each other as recommended practices.

It was the absolute refusal of the USA to entertain this proposal, and the rough-house tactics of its delegation throughout meetings, that caused distaste and a blunt realization that it would ultimately be a battle of two governments, and that the two would be the UK and the US.

In my opinion the forum for settlement lies in the UK Government's hands, not in discussions at Montreal. Commonwealth airspace forms a considerable chunk of three-dimensional jet environment which cannot be dictated to by ICAO without the approval of the Commonwealth countries. The Commonwealth countries require just one show of strength on this issue from the mother country, and the picture would, by force of usage, change to the benefit of British industry.

The Decca system can be developed to portray VOR facilitation *and* VOR. *The US system cannot portray both, nor can it offer the presentation which Decca developments can achieve.* Therefore danger will be less likely with a Decca coverage and VOR back-up and, indeed, may prove the best "fail-safe" system *in the development period* when we prepare for fully-developed automatic-data-transfer systems for current and future jet requirements. Britain cannot afford to lose her leadership in this field, coupled with the undoubted good work going on at BLEU.

We can perhaps stop worying about Blue Streakism and start on a full-scale financial-aid scheme for Decca coverage, coupled with all-out financial aid for sophisticated development of the Decca principles. The possibilities for business are sound and far-reaching—it just needs a little more money and straight commonsense to be injected into UK activation of the British aids, instead of bowing to what can only be an ICAO set-up the like of which has not been seen since the days of Tammany Hall politics.

The Government cannot complain about the UK representation at ICAO; Heaven knows, it is terrific. But it's money that is needed by most of the small States who raise their wavering little palms for Uncle Sam—they would do it for *us* if we promised to pay *with* the installations and guide them.

As for the Commonwealth—they are strong with the UK for the development of the system *now*, but it cannot be expected of them that they "go it alone" if the UK wavers.

How much prodding does the Minister of Aviation need to see the prospects for British investment in almost every sphere of British Aviation interests being diverted to large US syndicates, through weasle-worded ICAO resolutions, motivated by lobbying tactics, which, if parallelled in UNO, may well explain our troubles all over the globe in political fields?

I still believe ICAO can be useful to us all—but this effort by the US has strained loyalties of many of us in its efficiency, despite its most excellent staff of the secretariat, who are above reproach.

Get the Decca aid fully developed, and start now is my suggestion to the Minister, and even if it costs you £10,000,000, you will start a Commonwealth network of safety, chargeable to operators through landing costs, which will amply repay your investments. Naturally, those operators who were willing to take a part in such development could expect a package-deal which would absolve them from a large portion of the charges, and it would be for the waverers to count the odds.

It wouldn't take long to see a complete reversal of the current decision, in favour of Decca as a recommended practice now, to be an obvious standard with development. ICAO does not build aeroplanes or fly them, so don't let's get overawed by the "system," or we'll never get off the ground.

Cobham, Surrey LAWRENCE ARTHUR

[We heartily agree that more financial support in the past would greatly have changed the Decca story and that determined financial and operational support might well be the key to its future success. The technical potentialities already exist. In this connection the fact that Decca is a trade name may have placed the system at a disadvantage. It could be reasoned that the name be changed, say, to Pictorial Area Coverage (PAC) and the whole system regarded as a national enterprise rather than as a one-company venture.—Ed.]

Airline Size

IN a recent issue [March 4, p. 323] *Flight* listed the world's biggest airlines in order of load ton-miles carried per year. Another yardstick—that of numbers of passengers carried—produces the following order of size for the year 1959:—

	Thousands of passengers
Eastern	8,617
American	7,752
United	7,155
TWA	5,509
Capital	3,871
TCA	3,209
BEA	3,207
Delta	3,097
PanAm	2,964

A point worth mentioning, since it is not generally realized, is that in 1959 both BEA and BOAC each carried more international passengers than any American airline except Pan American.

London W1 A. N. HAYNES,
Public Relations, British European Airways

World Aerobatics Championship

IN addition to the Lockheed Trophy—which, in itself, is an international competition—the Czechs (presumably sponsored by their government) are holding at Bratislava, between August 28 and September 4, an aerobatic competition which they are calling the First World Championship in Aerobatics. The rules for this competition, which are based on experience gained in the Lockheed, have been very carefully worked out, and will undoubtedly provide a first-class aerobatic test, primarily for the pilot.

Civil aviation is an international affair. The reputation of any one country's pilots in the civil aviation world is a matter of importance. Those countries whose air pilots bear a good reputation will naturally find it easier for their nationals to get jobs in civil aviation, under no matter what flag. The country whose pilots win the World Championship in Aerobatics will undoubtedly be considered the country whose pilots are skilful. Here we have a great number of pilots but we have not a great number of skilled aerobatic pilots. The reason for this is that up to a short while ago we had few suitable aerobatic aeroplanes.

Over the last four years the Tiger Club has been developing

CORRESPONDENCE . . .

aerobatic aeroplanes in the form of specially adapted Tiger Moths, and in the hands of skilled pilots these Tigers, or "Bishops," can be made to perform practically all the known manœuvres, and in particular, all those required in Sets 1 and 2 of the obligatory figures laid down for the World Championships.

Although it is obviously possible to design a better aerobatic aeroplane than the Tiger, it would be extremely expensive to do so. In judging aerobatics, the pilot should be judged and not the aeroplane. The aeroplane which makes it too easy for the pilot to perform will disguise lack of skill. One of the advantages of the "Bishop" Tiger from the aerobatic point of view is that, while it may be made to perform every figure necessary, it needs skill as there is little surplus power.

To enter a team in the World Championship, and to do the necessary practising, the Tiger Club estimates that they will require the following:—

Six willing pilots, of whom we already have the names, to be provided with approximately 50 hours' practice, each at a cost of around £6 per hour	£1,800
Preparing and maintaining three "Bishop" Tigers, which are already in existence, approximately £750 per machine	£2,250
It is proposed to eliminate three pilots and to send to the Championships three pilots and three aeroplanes. The cost of travel, including mechanics, accommodation, etc., will probably be around £500	£500
Total	£4,550

The Tiger Club therefore suggests that, for the sum of around £5,000, it would be possible to put up a worthwhile British entry this year in both the Lockheed Trophy and in the World Championship in Czechoslovakia, and also possibly to enter any other competitions which may be held.

The question is—where shall we get the money?

London EC4 NORMAN H. JONES
Chairman, the Tiger Club

Martinsyde Memory

I HAVE just been reading your February 12 number, in which S. H. Handasyde was asking about ex-Martinsyde personalities. Perhaps he would like to get in touch with F. G. Miles, who, at Shoreham in the late 1920s, was overhauling a Martinsyde which became involved in a rather frightening incident.

I got the story from a great friend of mine, the late T. C. Sanders, who was an eye-witness. A first-hand story from Mr Miles might be of interest to your readers.

Largs, Ayrshire ERIC STARLING (Capt)

[Asked to comment on the incident, Mr Miles has sent us the following account from an early issue of "The Miles Magazine." He adds that this is "a fairly watered-down version."—Ed.]

"In the days when Southern Aircraft were buying up dismantled aeroplanes, reassembling them and selling them to various customers, Mr Miles acquired a Martinsyde airframe, and a Hispano-Suiza engine to replace the missing Wolseley Viper. The men had hardly started on the work of reassembly when a customer came along and said he would buy the machine if they could get a run out of the engine, just to prove it was a good one. The aeroplane was immediately wheeled out on to the aerodrome, a large post was wedged under the wheels and the engineers began to try and start the motor. After they had been working fruitlessly for some time Mr Miles came out of the workshop in his shirt-sleeves and, seeing they were in difficulties, came across to help. At this moment one of the G.E.s had the bright idea of doping the engine with ether, so Mr Miles swung himself up to the cockpit and, sitting on the edge with his legs hanging over the side, prepared to give contact and work the throttle.

"After two swings the motor started with a colossal roar. Before anyone could hang on to the wing the aeroplane had jumped the make-shift blocks and started off down the field.

"Mr Miles immediately did two things—banged the throttle forward on the chance that it was coupled up the wrong way; and switched off. He was right about the throttle, but the Viper only needed half the throttle movement of the Hispano, so that the full movement through the quadrant only dropped the engine revs very slightly. Switching off was a good idea, too—only the switches were not wired up.

"By this time she was well away and he had to swing his legs over the side and drop quickly into the extremely hard, uncushioned cockpit. There he seized the controls and succeeded in steering the runaway safely through a line of parked Avros. By then she was doing 40 m.p.h. and rapidly nearing the ditch. He had to decide whether to turn her over in the ditch at a slight risk to himself and certain bad damage to the machine, or to take her into the air and trust to luck and his skill to get her down in one piece.

"As all pilots would, he chose the air.

"Having climbed to about 500ft, he flew round and considered. Here was the position: the motor was brand new and running at nearly full revs. He was not sure how much oil and petrol there was. This would not have been very important had the aeroplane been in flying trim, but the wheels had no tyres and were only held on by nails through the hubs; the wings were rigged by eye and none of the wires or cables was locked; the elevator and rudder were working, but of the ailerons only one of the four was coupled up—and that only by one operating cable to the bottom aileron; the return cables were not coupled at all. At high speeds it was possible to turn and bank on the rudder, but below 70 m.p.h. it was impossible to pick up the left wing if it dropped.

"Having catalogued all these snags in his mind, Mr Miles turned his attention to the engine. He found three different petrol cocks and, by experiment, discovered which one turned the petrol off. The carburettor of the Hispano held nearly a minute's worth of petrol, so very nice judgment was required to turn the petrol off at the right moment.

"He started his attempts to land by flying in straight from 500ft at about 70 m.p.h. and then cutting the petrol a minute before he expected to touch down. Several times he thought he had misjudged and turned the tap on again just before the engine stopped. Once he had his wheels safely on the ground but the engine picked up again with a roar and off he went.

"After this he suddenly had the idea of flying over to Tangmere, where he would have an enormous space to land on and the services of a fire-engine and an ambulance. But alas! as he got over Worthing one of the cylinders started missing and, thinking that others would soon follow suit, he turned back again.

"As he came back over the little 22-acre field that served Shoreham as an aerodrome, he saw that the ground staff had now organized a rescue party. He recognized the doctor's car parked on the edge of the field and saw the firm's car filled with men and fire extinguishers. Once more he got into position to do a straight approach, turned off the petrol cock and glided in at 70 m.p.h. This time he had judged correctly. The Martinsyde sat down as sweetly and quietly as though she had been in perfect flying trim. Even the wheels stayed on.

"This story has many morals attached to it, all too obvious to need repeating here. As the result of his experience Mr Miles made several good rules for himself on the subject of testing—some of which, one must admit, have since been slightly broken."

Private-flying Representation

RESPONSE to your Sport and Business Flying number (March 25) has to my mind been rather disappointing, if the Correspondence column is any criterion.

While the feature was a shot in the arm it was by no means complete and should, if your list of groups has any meaning, have included the Popular Flying Association, which has done as much as any to get the working-class man into the air. While we as numbers may lack funds we certainly do not lack enthusiasm. I think most people want a cheap aeroplane and the space to fly it in with the minimum supervision. One way of achieving this aim would be the use of automobile parts and techniques in production, with the minimum of overheads and profits. Henry Ford, I am sure, worked on these lines and sold a lot of Model Ts before he died a very rich man.

Finally, I come to the question of representation [as mentioned on page 418 of the above-mentioned issue]. Air Cdre Paul was absolutely right when he opined that we should be represented by one body: it should be the Royal Aero Club, which has always been the representative of Great Britain with the FAI, and has had dealings in Parliamentary matters. I do not think that the PFA are too proud to let another body represent it. Members of the committee are elected on the PFA to represent the organization in the best possible way and the insular attitude adopted by Mr G. H. M. Miles would not be countenanced.

However, the time is more than ripe for the petty squabbles of the various organizations to be patched up and a united light aviation movement under the guidance of the RAeC to talk to the Minister and obtain the maximum possible. I am certain that any largesse will be distributed by the RAeC without fear or favour.

Mr Sandys is a very busy man who seems prepared to talk with a united body but not with a squabbling rabble.

If the respective committees cannot get together then they should all resign and let the clubs, groups, private owners, constructors and pilots vote in a plebiscite to achieve our aims, otherwise we may as well fly kites.

London W7 R. W. MILLS,
MPM Flying Group (Gp 34 of the PFA)

FORTHCOMING EVENTS

May 13-15. Channel Islands Aero Club: International Rally, Jersey Airport.
May 14-15. Verona Aero Club Rally.
May 17. RAeS Historical Group: Lecture by Sir Thomas Sopwith.
May 19. RAeS: 48th Wilbur Wright Memorial Lecture, "Mathematics and Aeronautics," by Prof M. J. Lighthill.
May 20-21. RAeC: Business and Touring Aircraft Competition, Shoreham Airport.
May 22. Elstree Flying Club: Breakfast Patrol.
May 25. Royal Society of Arts: "Problems and Prospects of Air Transport," by Peter G. Masefield.
May 28-29. Skegness Aero Club: International Rally.
May 28. Northern School of Aviation Flying Club; At Home and Flying Meeting, Squires Gate, Blackpool.
May 29. Doubs Aero Club: Touring Aircraft Rally, Besançon.
June 3-4. RAeC: London - Cardiff Air Races, Rhoose Airport.
June 5. Champagne Aero Club: International Rally, Rheims.
June 5-6. Leinster Aero Club Rally.
June 5-6. Fréjus - St Raphael Aero Club: International Provençal Wine Rally.
June 5-6. Vichy Aero Club: International European Aviation Meeting.
June 5-6. Alsace Aero Club: European Light Aircraft Meeting, Strasbourg.

For their first Boeing 707-320 (with new fin and rudder) South African Airways have designed this new livery, with orange tail. Roll-out was on May 3 and delivery should be in July, prior to the start of services in October. The name of the first aircraft is "Kaapstad"

AIR COMMERCE

IATA LOOKS AT JP.4

"LARGEST IATA meeting yet held" was the description applied to the 13th Annual Technical Conference at its opening by chairman Knut Hagrup, SAS vice-president of operations, engineering and maintenance. Delegates from over 90 airlines attended; and by May 10, when the sessions closed, more than 500 people were expected to have been present.

Emphasis this year was on analysis of jet operations; and agenda subjects carried such titles as "Review of problems encountered in turbine-powered operations in respect of ATC and associated services in the upper air space and in terminal areas," and "Exchange of views and experience on jet aircraft training for flight crews."

But one way and another practically every operational problem currently affecting air transport came under review. The first agenda item was a look at the application of Doppler in the light of more than a year's experience by a number of airlines; another concerned flight information in the cockpit and cockpit design and layout—a subject which, it might be thought, would alone occupy every member of the conference for the whole ten days; a third was take-off and flight planning in the light of current experience; while others dealt with turbine aircraft on the apron; maintenance aspects of turbine aircraft; recorders for operational performance analysis and aircraft noise.

Certainly, IATA does not shrink from the big issues. Within the space of a few days the conference also hoped to discuss the engineering and maintenance problems involved in aircraft pooling and interchange agreements, and to review aircraft turbine fuel requirements. "As JP.4 tends to come cheaper than kerosine," said the conference chairman, "we may unfortunately be forced to go over to it. Kerosine is IATA's recommended standard specification but the finance people want us to tank the aircraft with kerosine in one place and JP.4 in another." He added that aircraft range, payload and fuel gauges and other meters would be affected, but he did not mention a greater risk of fire.

SIR GEORGE CRIBBETT RETIRES

THE retirement, for reasons of health, of Sir George Cribbett, BOAC's deputy chairman, took place last week. He is to continue his association with the corporation as a board member of BOAC Associated Companies Ltd.

Sir George assumed the post on May 1, 1956, after a distinguished career in British and international civil aviation. He was a pilot and flying instructor in the First World War, served in the Exchequer and Audit Department in Whitehall between the wars and was a principal in the Air Ministry at the start of the Second World War in 1939. One of his great tasks was the formulation of Britain's post-war international air policy, including the adoption of the Five Freedoms of the Air and the system of international exchange and traffic rights based upon those freedoms. He was knighted in 1948.

PRESS ON SANS REGARD

SWISSAIR is now advertising in its timetables and accepting reservations for Caravelle movements from London within the "banned" jet night-flying period of 2300hr to 0700hr.

So far BEA are the only jet operators to have received permission from the Ministry for night jet schedules. This airline also took approval for granted by advertising night schedules in its timetables and accepting bookings before the Minister's approval.

It will be recalled that BEA were required to carry out Comet 4B noise tests before approval was given: details of these tests are not available for inspection.

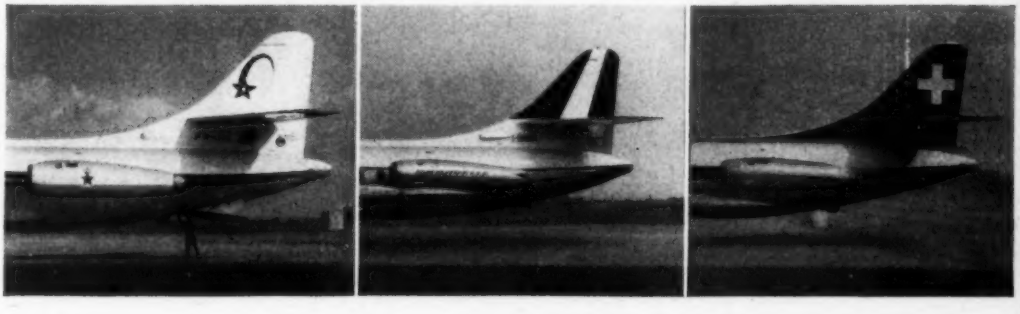
Will the Caravelle, which is generally considered to be a noisier airport neighbour than the Comet, be required to go through the pantomime of tests? If the Minister is to be consistent, yes; but they need only to be of a token nature, since he is again unlikely to publish the results. In any case, the conclusion is foregone. The Minister, though far from powerless, is unwilling to interfere with the rights of air transport, or to drive airline customers away from London Airport.

Meanwhile the local residents, who feel their reasonable rights are being ignored, are not in an apathetic mood.

Details of the Swissair Caravelle movements at LAP after May 24, and advertised as subject to Government approval, are: Departures, 1130, 1905, 0130; arrivals, 1035, 1815, 2325.

INTERNAL SERVICES BOARD

"THE United Kingdom has made less progress than was to be desired in building up an effective network of internal services." This was the suggestion made by a deputation from the Welsh Advisory Council for Civil Aviation who went to see Geoffrey Rippon, Parliamentary Secretary to the Minister of Aviation, last week. The leader of the Welsh deputation, which included Raymond Gower (Conservative MP for Barry), S. Kenneth Davies (past chairman of the Royal Aero Club) and Vernon Lawrence (secretary to the Welsh Advisory Council for Civil Aviation), said that a new organization should be set up to consider how to build up a more effective network of internal services. They alleged that the situation in Wales had been completely neglected by BEA, but they also made it plain that they did not hold much brief for the situation in Scotland either. Scottish civil aviation, they said, was in effect partly subsidized and many of BEA internal services were still supported out of the commercial profits of its European routes.



This Caravelle tail-chase illustrates three recent deliveries from Sud Aviation's factory at Toulouse. Royal Air Maroc (left) were on the verge of receiving their aircraft when this photograph was taken, Alitalia (centre) took delivery on April 29 and Swissair on May 3. News of a faster Caravelle with a new wing is given *on page 670*

Pictured during demonstrations at Galeao Airport, Rio de Janeiro, the Handley Page Herald is flanked by Brazil's modern buildings and a rather less up-to-date Beechcraft 17. For details of the Herald's current tour, see story below

AIR COMMERCE . . .

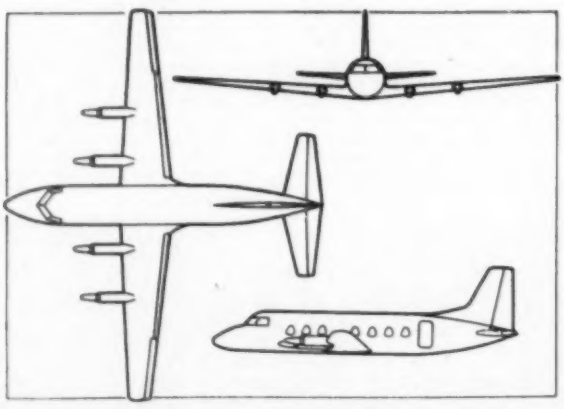
CAPITAL ARE FIGHTING

AS we go to press, Capital Airlines are still searching for ways in which they can avoid bankruptcy, a Damoclean sword which hangs over them on a very slender thread indeed. Its two strands comprise further appeals to the Civil Aeronautics Board for subsidy and a stay on the foreclosure petitioned for by its already over-patient creditors.

Hopes of achieving the first alternative, an injection of subsidy by the US Government, has never been great and now are fading. The CAB appears to be completely unmoved by Capital's distress because it holds little brief for "subsidizing bad management." Instead an investigation has been demanded into the causes of Capital's financial problems.

According to *Aviation Week*, the CAB are anxious to determine: (1) Whether Capital's operating certificates should be modified or suspended; (2) whether the transfer of the airline's routes to another carrier would be in the public interest; (3) whether the integration of Capital's routes with those of other carriers by merger or transfer of routes is needed; and (4) what other remedial action should be taken to rectify the present situation. Each condition, it might be noted, is qualified as being a decision "in the best public interest," but it seems clear that the CAB's interpretation of this is not to resuscitate Capital's depleted finances. It is reported that the airline's current operating expenses are being met only by deferring provision for payment of interest and depreciation charges.

The other thread keeping Capital from the receiver is the hope that it will be possible to stave off bankruptcy by reaching an agreement with the British noteholders which would allow foreclosure to be postponed. It is being argued that Vickers have the most to gain by helping Capital to reach some sort of solution to their immediate problems, in the hope that reorganization would lead the way to the notes eventually being repaid. It is understood that the greater part of the outstanding notes are insured by the Export Credit Guarantee Department but that claims can only be made on the insurance guarantee provided that Vickers have taken "steps to minimize the losses."



Here is the first general arrangement drawing of the Potez 840 (four Turboméca Astazou) a French turboprop of a class much in the news. First flight should be early next year. Two prototypes are under construction. A broadly similar design, with civil and military applications, is being considered by Sud and Marcel Dassault

Meanwhile, the Capital Airlines Shareholders' Association—composed of about a thousand of the airline's employees—are hoping to arrange a meeting with Vickers themselves. Capt Charles Beatley, a Capital pilot and the president of the association, said in Washington last week that he was going to ask Vickers to postpone mortgage foreclosure proceedings (Vickers hold a £12 million mortgage on 89 of the airline's 96 aircraft) until the next shareholders' meeting. As this will not be for two months, Capt Beatley is asking for a substantial breathing space. "We believe," he said, "that the Association has a logical plan that will be acceptable to the British interests that hold the notes." Details have not been given, but it appears that his suggestion is to cut all salaries by one per cent and pay this amount monthly to Vickers. This would amount to about £178,000 a month and by this method alone full repayment would take 5½ years.

COMETS FOR AIR LATIN AMERICA?

THE projected supranational airline of South American carriers—proposed name Aerea Latinoamericanas—might, it is rumoured on the South American continent, purchase Comets with which to replace the assorted piston-engined equipment of the five or six individual operators. The Comet has an appeal in South America as a jet of compact size which could be used on premier services in face of the increasing seat capacity that is becoming available with the US jets.

Meanwhile, the collectively powerful non-IATA Latin American operators have met again to discuss opposition to the Association, whose rate-making policies they regard with disfavour. No South American airline is particularly friendly towards IATA today, writes a correspondent, as the international fares structure "definitely favours more sophisticated markets and living standards." Non-IATA international airlines have been contacting IATA-member national lines "with the object of forming a solid front against the Association"; there is a feeling that some lines joined IATA because they feared to be left out or possibly out of a feeling of good fellowship. But in South America perhaps more than anywhere the need is to reduce fares rather than to increase speed.

GLOBE-TROTTING HERALD

TWO more tours in the Herald's world series have been planned for this year, it was announced by Handley Page last week. These will be the fifth and sixth, and will undoubtedly make G-APWA, the production Dart Herald now in South America, the most extensively travelled turbine demonstrator ever.

But the position of the company *vis à vis* British industry amalgamations must be causing some concern abroad, in particular among operators who want to be able to guarantee after-sales parts and service over the whole of the aircraft's life span. This problem is still an important one on the day that the aircraft is sold second hand. It might be a sound suggestion just now for Handley Page to make a special point of selling not only the excellence of their aircraft but also their ideas for after-sales support. An extra effort could perhaps be made to show that Handley Page's Herald customers would benefit from factory backing regardless of any changes which the firm might be put under pressure to undergo.

The fourth, current, demonstration tour has so far covered Ghana, Nigeria and Brazil. As previously reported, in Brazil the eleven-week tour was interrupted to fly food for flood-relief operations in the Fortaleza area. Elsewhere, the aircraft has been operated under particularly difficult conditions. Typically, simulated engine failure before unstick has been demonstrated from "awful" airfields, but the aircraft, in the words of the pilot, Capt R. Shilton of Silver City [as quoted on page 665] "has continued its superb performance with literally no snags at all."

Demonstrations have been given—among others—to the

Brazilian air minister and to COMTA, the Brazilian Air Force transport command. A pilot of the latter organization is reported by the demonstration team to have remarked that the aircraft was the best of its type that COMTA has had to handle.

The fourth tour ends on May 24.

PROGRESSIVE TICKETING

THE prospect that BEA may, possibly in the spring of 1962, introduce "walk-on ticketing" (see Lord Douglas in *Flight* for April 8) makes it timely to review progress in the US. Some months ago Allegheny and Continental inaugurated passenger services differing from standard operations in the way in which reservations were booked.

Continental's "instant boarding" plan permits passengers to board a 707 without previously having checked in at the airport counter. Boarding may be accomplished with or without a ticket. After boarding, a type of bus conductor or, to give him his full title, "director of passenger services," collects fares from those without tickets. This official (male or female) is able to advise on such matters as connecting reservations and other travel problems by means of a special air-to-ground radio telephone system with the office.

Allegheny's "commuter" service, which is operated with Napier Eland-powered Convair 540s, is essentially a dual-fare operation. Full fare-paying passengers follow standard procedures, but passengers making use of the commuter concession by-pass all checking procedures and, instead, report directly to the departure gate. There they insert a previously purchased "no reservation" ticket into a machine which prints the time of the day on the stub. After all first-class passengers have boarded, the commuters fill the remaining seats on a first-come-first-served basis, as established by the time stamped on their tickets.

Although commuters may freely occupy any seat, including those next to a full fare-paying passenger, they receive a 35 per cent fare discount—for the simple reason that they have cost the airline less to handle.

Passenger response to these innovations has been rather remarkable, say both Allegheny and Continental. Allegheny's commuters now account for nearly half the traffic on the flights which offer this concession. This figure is nearly 15 per cent above the proportion recorded during the experimental inauguration of commuter services last year. Allegheny's plan seems particularly appropriate for the high density short-haul routes.

Those who fly regularly the New York - Washington route, which is probably the world's busiest, find particular difficulty in arranging their return trip. On perhaps less than 10 per cent of occasions they do not know the flight on which they will return with any degree of assurance, so they make multiple reservations. Such a procedure, multiplied countless times by several passengers, causes no end of "no shows" and results in low load factors. How much better it seems to be, at any rate on routes where frequency is high, to forget all about reservations and simply to board the first convenient flight. Perhaps Allegheny's plan is the solution. Continental's scheme will help travellers on long distance flights by eliminating some of the multiple check-in procedures now practised.

Signing a multi-lateral agreement on C of As for imported aircraft at the Paris office of ICAO is M. M. V. Custance, deputy secretary, Ministry of Aviation. Countries represented were Finland, France, Ireland, Italy, Luxembourg, Portugal, Spain, Sweden, Switzerland, and the United Kingdom

BOAC SELLS ITS SURPLUS

GOOD progress has been made by BOAC in the disposal of its surplus aircraft, as is illustrated in the table below, although the financial aspect of the picture is not too clear. In no case have BOAC disclosed the price for which their surplus aircraft have been sold. The corporation's last annual report and accounts recorded a net loss of £1,123,069 on the disposal of aircraft and other assets. This was written off as a capital loss.

No.	Type	Sold To
16	Stratocruiser	14 to Transocean*
20	Argonaut	3 to EAA
		9 to Overseas Aviation
		4 to the R. Rhodesian A.F.
		3 to Aden Airways
2	Dove	
10	DC-7C	
16	L.749 Constellation	4 to Skyways
		3 to Pacific Northern Airlines
		2 to Capitol Airways
		4 to Transocean
		3 to Avianca

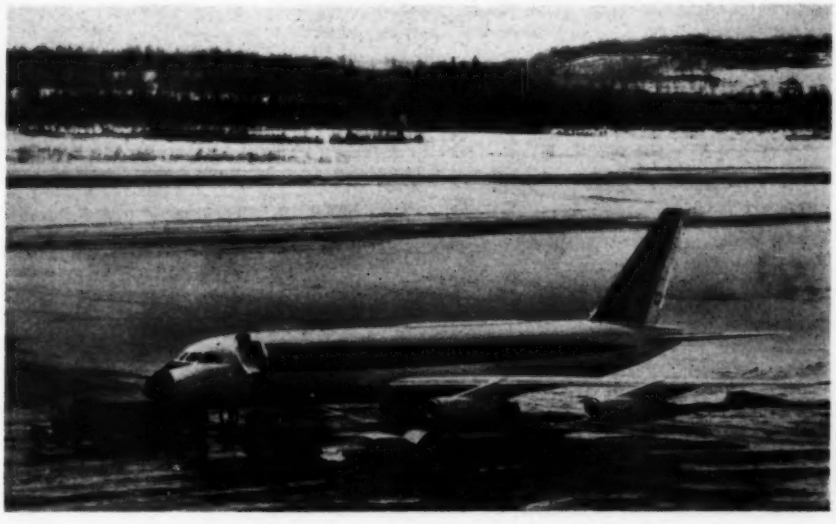
*Remaining two broken up at Stansted.

That similar losses are all too likely to recur in future years was shown by the corporation's placing on the market last November of two of its DC-7Cs at the arbitrary figure of $1 million (£357,000) each; these ten aircraft cost a total of $36,500,000 (£13,000,000) with spares in 1956. As is well known, an "express undertaking" was given to the Government that these aircraft would be sold for dollars when the Britannia 312s entered scheduled service on the North Atlantic, which they did in December 1957. It has been reported that Overseas Aviation have shown some interest in two of these DC-7Cs, but so far there is no news of any potential dollar customers.

That there *is* a potential dollar market for such second-hand aircraft as these is illustrated by the recent acquisition of 12 ex-American Airlines DC-7Cs by Overseas National Airways, one of the biggest US supplemental carriers, for trans-Pacific flights under military contract. Certainly this class of carrier would seem to be the corporation's best dollar sales prospect for DC-7Cs.

The 14 Stratocruisers were traded in to Boeing as part-payment for the corporation's 15 Boeing 707s, and BOAC's 1957-58 annual report disclosed that "amortization rates for the Stratocruisers have been adjusted, so that their residual value next year [i.e. 1959] would be that which Boeing will pay for them in the turn-in deal against the 707s on order." Boeing appointed the Babb Co as exclusive agents for the sale of these Stratocruisers, and all 14 were disposed of to Transocean Airlines (TALOA), the first being delivered to Transocean in July 1958.

TALOA, one of the best known US supplemental carriers (though it is now reported to be in financial difficulties) has been operating its Stratocruisers on low-fare services across the Pacific as far as Okinawa, and between New York, Chicago, Los Angeles



On ice but not icebound at Anchorage, Alaska: a General Dynamics Convair 880. It is undergoing tests in heavy icing conditions in the upper atmosphere as part of its functional and reliability tests for the FAA. Over 154hr of this programme had been completed by the end of last month

KLM, Alitalia and Swissair, have all recently received DC-8s. Here, at Zurich, is the first for Swissair, now being worked up in preparation for North Atlantic service on May 8

AIR COMMERCE . . .

and San Francisco. TALOA, incidentally, offers a New York - San Francisco single tourist-class fare of $80 on its twice-weekly service between these two cities as compared with $105.50 for a single ticket charged by American, United and TWA. This is an interesting example of how intelligent regulation by an independent air transport authority can provide an outlet for low-cost air transport and at the same time solve the problem of finding employment for surplus piston-engined equipment.

Of the unsold aircraft, the two Stratocruisers are retained for charter work and the remaining Argonaut is used by BOAC's apprentices for practical training. Overseas Aviation has since sold one of its ex-BOAC Argonauts to the Danish firm of Flying Enterprises A.B.

WERE WE "UP A GUM TREE"?

OUR Australian contemporary *Aircraft* takes us to task in respect of a note about Qantas in our issue December 11, 1959. In it we suggested that "it is a moot point whether or not Qantas should be considered [by virtue of its heavy mail rate] to be on subsidy." Our Australian colleagues think that "someone or something" has led *Flight* "up a gum tree."

The implications of the words "someone or something" are, possibly, that an interested party has been bringing pressure to bear on *Flight* to emphasize the extent of Qantas's mail payments. In fact, our conclusions were entirely our own; and on brushing up our works of reference it seems that, far from being up a gum tree, we may have under-emphasized the degree to which Qantas leans upon mail revenues.

At present no less than a quarter of the airline's revenue comes from mail. This proportion has been tending to fall, for in the early 1950s it stood at about a third. *Flight*'s analysis of recent airline accounts, and financial statistics published by ICAO relating to earlier years, show that no airline anywhere receives such a rich mailbag as this. For comparison, the estimates for 1958 show that world airlines as a whole received only 5 per cent of their revenue from mail.

Qantas's unique position is due partly to the fact that people in Britain and Australia are awfully keen on letter-writing. But even more significant are the mail rates which the airline receives. Because of variations in the terms of the Qantas-BOAC pool it is dangerous (as *Aircraft* rightly points out) to take a figure for one year as being typical. However, if we take a long-term view, we find that over the past five years Qantas's average mail rate has tended downwards from about 150d (Australian) to 130d per l.t.m. Now if Qantas had been paid the same rate as KLM, namely a little under 100d, then the Australian carrier would have shown not a profit of £½ million in 1958 but a loss of £1 million. It may be suggested that KLM are not typical, and this we freely confess: KLM mail rates are also rather above the world average at about 70d per l.t.m. If Qantas had had the misfortune to be paid at this average rate, then their books would have shown a loss of £2 million.

Perhaps the key to the views expressed in *Aircraft* is to be found in their suggestion that if Qantas are to be regarded as being on subsidy then "so is BOAC and every other airline that *merely* [our italics] gets the mail payments to which the Universal Postal Union agreed." The point here is that the British and Australian governments are among the very few who are so generous as to pay UPU rates to their national carriers. These rates normally apply only to the relatively small amount of mail traffic that airlines manage to get from foreign governments after the appetites of their national carriers have been satisfied.

"LET'S GET WHAT WE NEED"

FURTHER to our note last week about the welcome that Continental Airlines extends in its annual report to the prospect of supersonic airliners, it must be recorded that IATA do not seem to share this airline's unqualified enthusiasm.

Acknowledging that supersonic transport must come, but still licking the wounds of an over-hasty financial commitment to subsonic jets, IATA has decided to meet in the spring of 1961 to "make certain that if we do go to supersonic aircraft, we will get what we really need, and not what manufacturers may have to sell." These are the words of IATA's technical director, Stanislaw Krzyczkowski, who announced the meeting. Joining the discussions will be manufacturers, air forces, research establishments and other international organizations, and all the implications of a supersonic air transport system will be thoroughly gone into.

The agenda of the meeting is being drafted by a special IATA group headed by Knut Hagrup, chairman of the IATA technical committee (see page 667). The supersonic meeting will be the principal feature of the 1961 IATA technical conference, which is to be held somewhere in North America twelve months hence.

CARAVELLE HOT-ROD

THE Caravelle goes on and on. Not just as one aeroplane or even as a series of variants, but as a French national bid for leadership in the medium-range class of airliner. At the end of April were announced Sud and Dassault plans for a supersonic Super Caravelle which would cruise at M2.2. This week comes news of the Caravelle 14, a new version to be equipped with a new wing of Douglas design and powered by Rolls-Royce RB.141/11As of 15,000lb thrust. With this announcement are answered many questions about the part that Douglas would play in participating in the project. The new Caravelle would be a direct competitor to the three-engined Boeing 727 and with the new wing and the Rolls-Royce engines should be capable of cruising at M.84. Maximum gross weight, it is reported, would be 104,000lb, although this is less than the 110,230lb already announced as the maximum take-off weight for the Caravelle 7.

Apart from the new wing there would also be, it seems, a further stretch of the fuselage so that the number of passengers could be increased from 85 (as in the Caravelle 7) to 95. This payload could be carried over a range of about 1,900 n.m.

THE EFFECTS OF A STRIKE

THE Aer Lingus Pilots' strike, which grounded the Irish airline's fleet for a total of 18 days during March, caused a drop in gross revenue for that month of about £40,000. There was a general fall in traffic results, with the exception of the load factor, which rose 2 per cent compared with March 1959. It should be remembered when considering the March 1960 results that Easter 1959 was in March and this year was celebrated in April. Statistics, in tabular form, are as follows:—

	March 1960	March 1959	Variation
Revenue passengers	23,134	26,519	−13%
Revenue passenger miles	5,271,000	6,283,000	−16%
Capacity (seat miles)	8,427,000	10,330,000	−18%
Cargo (kilograms)	439,000	640,000	−31%
Revenue passenger load-factor ..	63%	61%	+ 2%
Overall load-factor	63%	61%	+ 2%

BEA's £95,200 shareholding in Aer Lingus, it is now confirmed, is to be bought by the Irish Government, provision for this having been made in the 1959-60 budget. This sum represents 4.6 per cent of the £2,073,000 issued share capital. Lord Douglas, BEA's chairman, is also vice-chairman of Aer Lingus Téoranta.

Seeing for himself at Silver City's airport at Ferryfield on April 27 is Duncan Sandys, Minister of Aviation. He is being greeted here by H. C. Kennard, joint managing director of the airline

THE BOMB HAZARD

BRIEF reports that the accident near Calabozo, Venezuela, on April 28 to a Lineas Aeropostal Venezolana DC-3 had been caused by a bomb explosion (*Flight*, May 6) were elaborated during the immediate official enquiry in Caracas. The story told by the surviving co-pilot was that a passenger had ordered the pilot to alter course, which he refused to do. Three survivors among the passengers said that a Russian, Vjacheslav Lavinski, ran amok with a hand grenade. He rose from his seat and dashed towards the cockpit; passengers jumped up to restrain him and the pilot pinioned his arms against the cabin wall. When he broke away, he pulled a hand grenade from his pocket, withdrew the pin and threw the grenade against the wall. It exploded as the aircraft was approaching Calabozo airport. Out of control, the aircraft crashed and burned and ten of the 13 on board were killed. The investigating team subsequently discovered grenade fragments and powder burns to support the survivors' stories.

YEADON SWINGS AHEAD

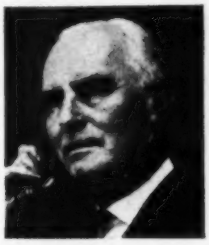
WITH five new BKS Air Transport routes, operating to Bergen, Bilbao, Guernsey, Mallorca and Stavanger respectively, in addition to scheduled services operating to last year's centres by Aer Lingus, BKS, North-South and Silver City, there should be a record number of movements through the West Riding airport this summer. To cope with the increased traffic BKS have placed in service a fourth Elizabethan and a fourth and fifth Dakota, all former BEA aircraft.

Meanwhile, work on razing redundant buildings to provide a new terminal area goes ahead and the construction of the new £400,000 terminal should begin shortly. Within the next few months the installation of radar will improve the all-weather facilities available at Yeadon. Plans for a third runway, 7,500ft long, running approximately north-west to south-east, envisage that the main Harrogate road, on the present western boundary of the airport, will underpass its northern end by a tunnel. The new runway will, in fact, be 500ft longer than the recently extended main runway at Manchester and could place Leeds and Bradford in the international category as an airport.

SEABOARD & WESTERN AND SHANNON

EXPANSION of freight operations over the North Atlantic is being undertaken by Seaboard & Western Airlines; and their new Canadair CL-44-D4 swing-tail freighters should enter service on the New York - Shannon route in 1961. This aircraft, which will carry 29 tons of cargo from Shannon, Seaboard's European maintenance base, to New York in a little over 7hr, ought to accelerate the growth of the airline's all-freight traffic from Europe. Freight carried by Seaboard from Shannon to New York and vice-versa has risen from 125,000lb in 1957 to 419,000lb in 1959 and this total should multiply when the "Air Age Industrial Estate" is fully established at Shannon. In the meantime, air cargo specific commodity rates have been reduced, in some cases by up to 40 per cent, on the Seaboard & Western route from Shannon over the North Atlantic to North America. Last calendar year the airline's cargo and mail revenue from scheduled services was £3,605,500 compared with £1,844,500 in 1958—an increase of 95 per cent.

J. K. Ambler, a director of Atlas Express, has developed Euro-freight, a continental-wide delivery, collection and air freight service on a through-rate basis



Richard Ashley Hall, a new director of Cambrian Airways. A Bristolian, Mr Hall's appointment is intended to strengthen West Country representation

BREVITIES

Capital Airlines have now been given until May 27 to file their reply to Vickers-Armstrongs' foreclosure petition. The original date was May 8.

Recent reports from Germany say that Air Union is likely to come into effect, as expected, on November 1.

Trans-Australia Airlines have bought two Hiller 12E helicopters for services in Australia, particularly for geophysical and mineralogical exploration.

According to E. R. Quesada, administrator of the FAA, all Electras will be structurally improved as a result of investigations following the accident at Tell City. Modifications have not yet been determined.

North-South Airlines have applied to the ATAC to operate between Leeds - Bradford - Bristol - Exeter and Leeds - Bournemouth - Sandown for seven years from June 1960. They would use Herons and DC-3s chartered from Don Everall.

The Mexicana Comet 4C has been grounded because the airline's pilots refuse to operate it without a substantial increase in salary. The airline say that they have asked de Havilland to cancel the outstanding order for three aircraft and take back the two already delivered.

New from Rootes is this Karrier Bantam self - propelled unit fitted with canopied service stairs by H. W. Edghill & Co Ltd of Hook, Hants. The stairs, which can be electro - hydraulically elevated from 9ft to 13ft 6in, are seen in use with a TCA DC-8

A duty-free shop was opened at Manchester Airport on April 24.

An airport hotel is to be built at Wilmslow, five miles from Ringway, Manchester. It will cost £800,000.

An air services agreement between Britain and Persia was signed in Teheran on May 2.

TWA and United are both reported to have made quite heavy losses in the first quarter of 1960 although TWA made a substantial profit last year.

Customs facilities are now available at Cambridge Airport but private aircraft will be cleared only if their movement coincides with a pre-planned schedule or charter service.

Two Viscount 755Ds are currently offered by Aircraft Exchange. The president of this service points out that should Capital find it necessary to sell even part of their fleet at distress prices this would saturate the market and values of all comparable Viscounts would tend to decrease.

The landing accident to the BEA Viscount 802 at London Airport on January 7 is understood to have been caused by loss of visual reference during flare-out in rapidly decreasing runway visibility. The fire which broke out was caused by friction of the collapsed nosewheel against baggage and was aggravated by hydraulic fluid from fractured pipes.

New Zealand National Airways Corporation have ordered an additional four Friendships for delivery from July, 1961, at a cost of £1,272,724 including spares. A repeat order has also been placed by PIA for two aircraft for delivery in 1961. These orders bring the Friendship order book to 79.

On July 1 air traffic control at Turnhouse Airport, Edinburgh, will be taken over by the MoA from the RAF. A control zone of two nautical miles' radius will be established around the airfield and the Scottish control area will be extended from the present eastern limits to cover an area bounded by Leuchars to North Berwick.

PanAm have been warned by the FAA that they are liable to a $2,000 fine for faulty maintenance and inspection procedures on a Boeing 707. The fuselage static vents were still sealed with insulating tape when an aircraft took off from New York on a scheduled flight to Paris on January 16.

After the photograph on page 669 went to press it was announced that the Convair 880 had been certificated by the FAA. Total hours of flight test time up to this milestone in the 880's history were 1,200. Commercial service starts this weekend with Delta's operations between New York, Atlanta, New Orleans and Houston. Deliveries to TWA will begin in May.

Lightning FAW.1s in RAF service: aircraft of the Air Fighting Development Sqn at RAF Coltishall, which was last week visited by the Secretary of State for Air, George Ward. The squadron, part of the Central Fighter Establishment, is carrying out trials and assessment and the English Electric Lightnings being evaluated are part of a pre-production batch of 20

SERVICE AVIATION

Air Force, Naval and Army Flying News

Thor Commemoration

COMPLETION of the last of the Thor missile complexes for the RAF, at North Luffenham in Rutland, was marked by commemorative presentations there on Thursday last week. An inscribed Bomber Command plaque was handed by the AOC-in-C, Air Marshal Sir Kenneth Cross, to the senior vice-president, engineering, of the Douglas Aircraft Co Inc, A. E. Raymond, who gave Sir Kenneth an oil painting of a Thor site.

High-level Competition

USAF B-52s from No 6 Bomber Wing of Strategic Air Command, based at Walker AFB in New Mexico, won the bombing section of the Bomber Command Bombing and Navigational Competition last week. RAF crews filled the first thirteen places in the navigation competition and the squadron trophies were won by Nos 207 (Laurence Minot and Armament Officers' Trophies) and 7 (Sir Phillip Sassoon Trophy) Sqns. The prizes were presented last Friday by the AOC-in-C Bomber Command, Air Marshal Sir Kenneth Cross.

Copy-book Rescue

IN what Air Ministry has described as a "copy-book" rescue operation, Fg Off John Cleaver of No 43 Sqn was winched up into an ASR helicopter off the coast of Cyprus only an hour after ejecting from his Hunter.

At Chivenor last December, when taking the HSE course (*Flight*, April 15), he had set a record of 14½ sec for inflating a dinghy and scrambling into it. On this occasion, when circumstances required his putting training to the test, Fg Off Cleaver sent out an SOS before ejecting. This was picked up by the Rescue Co-ordination Centre at Nicosia, which immediately "scrambled" a Sycamore of No 103 Sqn. Other aircraft, including a Hastings of No 70 Sqn, joined the search and were supported at sea by launches of No 1153 MCU. The Sycamore, airborne only four minutes after Nicosia's receipt of the first SOS, flew a round trip of 180 miles (piloted by Flt Lt Harvey Thompson) in effecting the rescue.

A Worthwhile Career

AT the Bristol UAS dinner recently Air Marshal Sir Alick Stevens, RAF (retd), said that the Blue Streak decision would add new life to the RAF's expensive V-bomber force. Replying to the toast of "The Guests" (proposed by the squadron's commanding officer, Sqn Ldr K. N. Rice), he commented that there was no possibility of the RAF not requiring manned aircraft in the foreseeable future and told squadron members: "You can rest assured there is a very worthwhile career in the RAF for you. We look to the universities to provide high-calibre entrants."

Among other guests at the dinner were Sir Philip Morris, vice-chancellor of the university; C. F. Uwins, joint deputy chairman of the Bristol Aeroplane Co Ltd; AVM J. Marson, AOC No 24 Group; and Air Cdre J. N. H. Whitworth, commandant of the Central Flying School.

Australian DOR

WITH a background of wartime radar development and night-fighter experience, Gp Capt I. G. Esplin has become Director of Operational Requirements (A) at Air Ministry with the acting rank of air commodore. Until recently he commanded RAF Wartling, the signals station near Pevensey in Sussex.

During the war Air Cdre Esplin flew with Nos 29 and 169 Sqns, and in between (1943) commanded the radar development unit in Scotland, at which Serrate airborne interception equipment was developed. He resigned his commission after the war and returned to Australia, his birthplace, becoming secretary of Qantas; then in 1947 came back to Britain and was granted a permanent commission in the RAF. He won the DFC in 1943 and in 1946 was made an OBE.

IN BRIEF

RNAS Culdrose, Helston, Cornwall, is holding its Air Day this year on Friday, July 15.

Leeds, Durham, Hull and Nottingham University Air Squadrons are competing for the Reid Trophy at Manby, Lincs, tomorrow week, May 21.

The 1960 AIRCENT reconnaissance competition, Royal Flush V, is being held at the French Air Force NATO base at Bremgarten in Germany from May 16 to 20.

Hastings and Beverleys of Transport Command airlifted 600 officers and men of the 1st Staffordshire Regt, with their fighting equipment, from Abingdon to Leuchars on May 3 for participation in a two-day exercise in Scotland.

Two Vulcans from No 230 OCU (RAF Waddington) carried visual tape-recordings of Princess Margaret's wedding ceremony from London Airport to St Hubert RCAF station, near Montreal, last Friday, for relay throughout North America.

The RAF Benevolent Fund has received £15,244 from 325 RAFA branches as a result of activities during Battle of Britain Week last year.

RAF Binbrook, Lincs, is the venue for this year's Royal Observer Corps summer camp. Some 3,000 members will attend between June 30 and July 23, in five weekly camps of five days each.

A reunion of those who served in the Operations Room at RAF Biggin Hill, Kent, during 1940 is being held in London next September. Those interested should write to the organiser, E. T. Pierce, 115 Priory Crescent, Aylesbury, Bucks.

The Air Minister, George Ward, said in Parliament last week that 343 claims for damage attributed to supersonic or low flying aircraft were received by his department between the beginning of last year and April 30 this year. He said in a written answer that 68 *ex gratia* payments had been made and a further 110 claims were still being examined.